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ABSTRACT

The purpose of this monograph is to present a theoretical framework useful for measuring structural unemployment. Developed on the basis of a literature review, this framework was applied to Canadian data. The approach which explains structural unemployment in terms of the causes of labor displacement is inadequate because it ignores impediments in the labor market adjustment process. The structural maladjustment approach used here takes these forces into account, although only the symptoms of structural maladjustment are quantifiable, not the forces themselves. A model was developed that determines the cyclical relationship between the unemployment and vacancy rates and attributes unexplained factors to changes in the level of structural imbalance. The model was intended to employ variables directly related to the labor market, to use a theoretical rationale, and to compare structural unemployment under various demand conditions. Several forms of the relationship between the unemployment and vacancy rates were empirically tested, using data derived from National Employment Service vacancy data. Results indicate that variability in unemployment is largely caused by variability in aggregate demand, with an upward trend in the structural unemployment rate from 3 percent in the early 1950's to nearly 4 percent in the 1960's. (Author/AG)

1969

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STRUCTURAL UNEMPLOYMENT

Theory and Measurement

G. Peter Penz

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Program Development Service
Department of Manpower and Immigration

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STRUCTURAL UNEMPLOYMENT

Theory and Measurement

by

G. Peter Penz

Program Development Service
Department of Manpower and Immigration
1969

FOREWORD

The Program Development Service of the Canada Department of Manpower and Immigration has a responsibility for economic planning, research and evaluation of the processes of manpower allocation and adjustment within the Canadian economy. It sponsors university research in these and related human resource areas, and also maintains a staff of professional and technical experts who undertake studies more directly related to the department's programs and objectives.

From time to time, studies are carried out that make a significant contribution to our theoretical or practical knowledge of how the labour market works in a time of rapid technological change. Structural or technologically induced unemployment has received wide currency in the popular press, but considerably less interest among Canadian economists. And yet, throughout the 1960's Canada and other western nations experienced difficulties in sustaining full employment even under market conditions so buoyant as to increase inflationary and international exchange pressures. Part of the reason for this unsatisfactory trade-off between unemployment and inflation can be traced to rapid technological changes that have rendered many traditional skills obsolete, and given rise in Canada to new initiatives in the fields of adult occupational training, immigration, manpower mobility, and regional expansion.

We are, therefore, very pleased to be able to publish "Structural Unemployment: Theory and Measurement" by G. Peter Penz. Penz, an expert in the field of manpower economics on the staff of the Planning and Evaluation Branch of the Program Development Service, is currently on loan to the Special Senate Committee on

Poverty. He defines structural unemployment as the *qualitative* imbalance between the demand for, and supply of, manpower at any point of time, and by using job vacancy information, he offers fresh insights into the labour market adjustment process, and the functional relationships between structural unemployment and job vacancies in Canada. I believe this study makes not only an important theoretical and empirical contribution, but it also has special importance for those who are now charting decisions that affect the use and productivity of Canadian manpower.

R. A. Jenness, Director,
Planning & Evaluation Branch.

PREFACE

The purpose of this monograph is to present a theoretical framework which could be used to measure structural unemployment. This framework was developed on the basis of a survey of the relevant literature and then applied to Canadian data.

In the survey of relevant literature the various approaches are categorized into the causal, the structural maladjustment and the policy approaches. The causal approach involves explaining structural unemployment in terms of the causes of labour displacement. This is considered inadequate, however, because it ignores impediments in the labour market adjustment process — a process whose function it is to wipe out the imbalances created by structural dislocations.

These impediments are considered in the structural maladjustment approach, together with the symptoms of structural maladjustment, and the forces promoting and impeding the labour market adjustment process are analyzed. These forces, however, are not quantifiable at present. The symptoms of structural maladjustment, on the other hand, are. A favourite method for determining changes in structural maladjustment has been to analyze the structure of unemployment. This monograph, however, supports the contention that the method is generally misleading. Analyses of long-duration unemployment are also considered not to be useful, although a framework involving the relationship of unemployment to vacancies is seen as fruitful.

The policy approach is concerned with the relationship of unemployment and inflation. According to this approach, the degree of structural maladjustment is indicated by the distance of the inflation-unemployment function from the origin. There are problems involved, however, in using it to measure structural unemployment, primarily because of the impurities contained in the relationship.

The next step is to develop a model that does not depend on proxies for labour demand, but uses variables directly related to the labour market, and has a theoretical rationale. This model must separate the effects of aggregate demand and structural imbalance on unemployment. It does this by determining the cyclical relationship between the unemployment and vacancy rates and attributing changes that cannot be explained by this relationship to changes in the level of structural imbalance.

Before the model can be applied to Canadian data, however, the vacancy rate has to be derived from National Employment Service (N.E.S.) vacancy data. The ratio of actual vacancies to N.E.S. vacancies is estimated on the basis of the ratio of total hirings to N.E.S. placements. Using the vacancy rate thus estimated, several forms of the relationship between the unemployment and vacancy rates are empirically tested.

The results indicate that very few of the changes in the total unemployment rate are attributable to changes in structural imbalance. Variability in unemployment is largely caused by variability in aggregate demand. There appears, however, to have been some upward trend in the structural unemployment rate (defined as the unemployment rate that would prevail if aggregate labour demand were equal to aggregate labour supply), from 3 per cent in the early 1950's to nearly 4 per cent in the 1960's. These results suffer from the uncertainty involved in the estimated vacancy rate, but an analysis of changes in the ratio of total hirings to N.E.S. placements, which was used in the estimate, supports the findings concerning the structural unemployment trend.

ACKNOWLEDGEMENTS

This monograph consists of my M.A. thesis, with some subsequent modifications.

Written while I was enrolled at the University of British Columbia, it was initially supervised by Dr. J. Tait Montague. Since then it has undergone considerable transformation. Comments by Dr. Gideon Rosenbluth and Dr. John Vanderkamp, both of the University of British Columbia, and by Dr. Sylvia Ostry, then Manpower Consultant to the Dominion Bureau of Statistics, were instrumental in making this transformation possible. Dr. Vanderkamp accepted the responsibility of supervision in the last one and one-half years of the non-resident period, during which time he gave me both encouragement and advice, particularly in the matter of simplifying the exposition. Finally, Dr. Ronald G. Bodkin made very detailed comments on the thesis after its completion, thereby establishing the basis for final modifications. I would like to thank these persons for their help. It goes without saying that the responsibility for any imperfections in this work lies entirely with me.

I would also like to thank both Dr. W. R. Dymond, Assistant Deputy Minister for Program Development, Department of Manpower and Immigration, and Dr. Duncan R. Campbell, formerly Director of the Department's Planning and Evaluation Branch, not only for giving me the opportunity and resources for the completion of this project, but also for deciding to publish the revised thesis.

G. Peter Penz

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CHAPTER I

INTRODUCTION

1. The Controversy about Structural Unemployment

In the first half of the 1960's a controversy raged over whether the sharp increase in unemployment in North America between 1956 to 1961 had primarily, or at least partly, represented an increase in structural unemployment, or whether it had been primarily or wholly due to a deficiency in aggregate demand. One of the major difficulties in this controversy was that the structuralist position seems to have emerged from political polemics and has rarely been formulated in rigorous economic terms by a proponent of this position.[1] This has led to a variety of interpretations of "the structuralist hypothesis."

Aside from the problem of interpretation, there has been the problem of testing the hypothesis. The tests have taken the form of analyses of productivity changes and their distribution among the various sectors of the economy, of the distribution of unemployment among the various groups of the labour force and changes in it, of changes in long-duration unemployment, of indicators of job vacancies and of wage and price inflation.[2] From nearly all of these tests the conclusion was drawn that there was no significant increase in structural unemployment during this period. However, as Richard G. Lipsey has demonstrated,[3] many of these empirical tests have not been fully thought out at the theoretical level. While they often presented interesting facts, the links to the conclusions which were drawn from the findings were often missing. Lipsey concluded, therefore, that a formal theory of structural unemployment is required.

2. The Purpose of the Thesis

The purpose of this thesis is to try to develop a theoretical framework which can be used to measure structural unemployment. Before doing this, however, the theoretical work that has already been done on the subject of structural unemployment and its related aspects is drawn together. This survey will also refer to empirical tests that have been undertaken, not for their results, but rather for their theoretical assumptions. These must be sound before the results can be trusted to provide reliable quantitative feedback for the theory of structural unemployment, a requirement that has not been met in much of the work in this area.[4]

From this survey the most promising line of model-building is then selected and further developed to make the measurement of structural unemployment possible. This model is finally applied to Canadian data to determine the level and trend of structural unemployment in this country.

3. The Outline

The survey of the theoretical work in the area of structural unemployment in Chapter II is divided into three parts. In the first part the causal approach to the determination of structural unemployment is presented. It contains analyses of the factors underlying structural displacement. In the second part, analyses of the factors promoting and inhibiting structural adjustment are presented, as well as the theory underlying some of the tests for the level or trend of the structural disequilibrium or maladjustment that is the net effect of these factors. The third part is categorized as the policy approach, according to which structural unemployment is assessed in terms of the relationship between unemployment and inflation. This relationship is significant because economic policy objectives demand the minimization of both variables, but reducing one has been observed to result in increasing the other, and this trade-off relationship is at least partly due to structural imbalances.

In Chapter III the concepts of structural equilibrium and disequilibrium are clarified and the Dow-Dicks-Mireaux framework, whose central variables are unemployment and vacancies, is used to analyze the interaction of changes in aggregate demand and of structural imbalances. This analysis makes it possible to separate the effects of these two factors on unemployment and therefore to obtain

a measure of structural unemployment.

In Chapter IV this measure of structural unemployment is applied to Canadian data. Since the vacancy statistics are inadequate, an attempt is made to derive an improved estimate from them. Empirical tests are then used to obtain the relationship between the unemployment and vacancy rates which are necessary to obtain the structural unemployment rate. Finally, the reliability of the results is discussed.

Chapter V contains a brief review of the theory and the empirical analysis. The policy implications of the results and the direction for further research are also discussed.

FOOTNOTES TO CHAPTER I

[1] The only exception seems to be Charles C. Killingsworth, "Automation, Jobs, and Manpower," **The Nation's Manpower Revolution,** Hearings before the Subcommittee on Labor and Public Welfare, U.S. Senate, 88th Congress, 1st session, part 5, 1963, pp. 1461-83.

[2] See, for example, U.S. Congress, Joint Economic Committee, Subcommittee on Economic Statistics, **Higher Unemployment Rates, 1957-60: Structural Transformation or Inadequate Demand,** 87th Congress, 1st session, 1961; Lowell E. Gallaway, "Labour Mobility, Resource Allocation, and Structural Unemployment," **American Economic Review,** Vol. 53, No. 4, Sept. 1963, pp. 694-716; Walter W. Heller, "The Administration's Fiscal Policy," **Unemployment and the American Economy,** ed. Arthur M. Ross, John Wiley & Sons, Inc., New York, (1964), pp. 93-115; Otto Eckstein, "Aggregate Demand and the Current Unemployment Problem," **Unemployment and the American Economy,** pp. 116 ff.; R. A. Gordon, "Has Structural Unemployment Worsened?" **Industrial Relations: A Journal of Economy and Society,** Institute of Industrial Relations, University of California, Berkeley, Vol. 3, No. 3, May 1964, pp. 53-78; N. J. Simler, "Long-Term Unemployment, the Structural Hypothesis, and Public Policy," **American Economic Review,** Vol. 54, No. 6, Dec. 1964, pp. 985-1001; Frank T. Denton and Sylvia Ostry, **An Analysis of Postwar Unemployment,** Economic Council of Canada, Staff Study No. 3, Queen's Printer, Ottawa, Dec. 1964; John Vanderkamp, "An Application of Lipsey's Concept of Structural Unemployment," **Review of Economic Studies,** July 1966, pp. 221-5.

[3] Richard G. Lipsey, "Structural and Deficient-Demand Unemployment Reconsidered," **Employment Policy and the Labor Market,** ed. A. M. Ross, University of California Press, 1965, pp. 210-55.

[4] After the completion of the survey chapter, an article entitled "Structural Unemployment" by John W. L. Winder was published in A. M. Kruger and N. M. Meltz (eds.), **The Canadian Labour Market: Readings in Manpower Economics,** Centre for Industrial Relations, University of Toronto, 1968, pp. 135-220. It, too, is a survey of the literature, but a more comprehensive one than the survey chapter in this thesis. However, it seemed to me to be somewhat less critical and there are certain differences in emphasis between the two surveys, with the Winder article stressing the trade-off approach and ignoring the Dow-Dicks-Mireaux model.

CHAPTER II

A SURVEY OF THE THEORY OF STRUCTURAL UNEMPLOYMENT

There have been, basically, three approaches to the theory of structural unemployment: (1) the causal approach, (2) the structural maladjustment approach, and (3) the policy-oriented approach. The causal approach focuses on the different types of structural change and their effect on structural unemployment. The structural maladjustment approach concerns itself with the adjustment mechanism of the labour market which is responsible for absorbing structural changes and with the manifestations of its shortcomings. The policy-oriented approach defines and analyses structural unemployment in terms of the effectiveness of various policies. The following survey is divided according to these three approaches.

A. THE CAUSAL APPROACH

The causal approach, on the whole, has consisted of loose descriptions of the structural changes in the economy that might be responsible for structural unemployment rather than rigorous theoretical analyses of the relationship between structural changes and structural unemployment. The causal approach is exemplified by Paul Casselman's succinct, but very general definition:

> "Structural unemployment may be defined as unemployment resulting from changes in the economic structure and in the economic environment."[1]

1. Types of Structural Change

What is meant by such structural changes has been expounded in the following definition given by H. D. Woods and Sylvia Ostry.

> "Structural unemployment . . . is that unemployment which stems from:
>
> (1) Major shifts in consumer demand arising from the creation of new products, spontaneous or induced changes in taste, the growth of competition of an imported commodity, etc., which reduce job opportunities for workers in a specific industry or group of industries, specific local areas or regions.
>
> (2) Technological changes which involve the substitution of capital for labour within a given industry or make redundant or obsolescent specific skills or products. A major technological change may introduce an entirely new industry which gradually destroys an established industry — motor cars and the carriage and wagon industry; electric light and oil lamps; refrigerators and ice boxes, etc. In such cases the resulting unemployment would arise from a combination of (2) and (1).
>
> (3) The exhaustion of natural resources in a given area.
>
> (4) Changes in the organization or ownership of industry that result in the closing down of certain plants for reasons other than those above."[2]

Presumably the last two types of structural change result in the geographic concentration of labour displacement and, therefore, in structural unemployment.

Casselman suggested three other possible causes of structural unemployment: (1) government policy, (2) war or the threat of war, and (3) the rate of population growth.[3] There is no doubt that government policy, which may have to observe criteria other than the smooth transfer of labour without unemployment, can introduce sharp changes in the types of labour demanded. Increased taxation to pay for higher expenditures for social capital, social services and military expenditures may lead to a shift in demand away from the private goods and services sector. Changes in production for military purposes have probably been singled out because of the magnitude of structural change involved in disarmament

and rearmament. Changes in the rate of population growth, if sudden as in the case of the post-war "baby boom", can create imbalances on the supply side by changing the ratio of labour market entrants to experienced workers.

2. Technological Change and Structural Displacement

Technological change is the form of structural change which is most frequently referred to as being responsible for structural unemployment. It will be useful, therefore, to see what relationship is presumed to exist between technological change and structural unemployment according to contemporary literature.

a. Microeconomic effects of productivity change

J. W. Knowles and E. D. Kalacheck have presented in their empirical study of the structural unemployment controversy a brief theoretical analysis of the different forms of productivity change and their impact on unemployment at the microeconomic level.[4] The analysis refers not only to the resulting structural displacement but also to the creation of job openings by technological change:

> "Job opportunities are continuously being curtailed in technologically unprogressive industries, and in those technologically advancing industries, the demand for whose product is inelastic with respect to price.
>
> At the same time, job opportunities are being created in industries blessed with the junction of rapid productivity increases and price-elastic demands, and in other industries whose demands are highly elastic with respect to income."[5]

Knowles and Kalacheck have identified four major types of productivity increase: (1) capacity expansion, (2) modernization, (3) geographic shift, and (4) the closing of obsolete facilities. The impact on labour displacement differs with the type.

Technological change incorporated in capacity expansion in order to meet growing demand will lead to no direct labour displacement. To the extent that part of the expansion in demand is at the expense of competing firms, however, there will be some indirect displacement.

When technological change is introduced to modernize a plant without expanding it, the number of layoffs at the particular plant may be quite significant. If there is no increase in output, the plant

which is modernized will have to dismiss superfluous workers. Even if it does increase output, it may still have to dismiss unsuitable workers, while hiring (possibly fewer) workers more suitable to the new production techniques. At the same time, layoffs will occur at competing plants.

If the increasing of productivity requires a shift in the location of the plant, this may result in the separation of the whole work force of a plant. The actual extent of the displacement effect will depend on the number of workers who move with the plant. In the case where a plant has become obsolete and submarginal, the immediate displacement effect is 100 per cent.

The extent to which labour displacement will lead to unemployment depends upon labour market conditions. Since "modernization and the closing of obsolete facilities become more significant contributors (to productivity advances) during periods when the capacity utilization ratios are low and aggregate demand is growing at a slow rate,"[6] these two factors are likely also to contribute to unemployment. Capacity expansion, however, generally occurs during periods of high labour demand so that layoffs are fairly easily reabsorbed in the employed labour force.

The length of unemployment will depend on the concentration of layoffs and on the types of labour laid off. The closing of plants leads to large-scale layoffs in one area, including older workers with low mobility and flexibility. This is likely to result in longer unemployment periods than would occur during plant modernization, where layoffs are more limited and where seniority rules are likely to protect the older worker.

b. Macroeconomic effects of productivity change

In discussing the basic assumptions of the structuralist argument that the increases in unemployment after 1957 have been primarily structural, Knowles and Kalacheck identified three ways in which technological change could possibly lead to a rise in structural unemployment in the economy at large: (1) an acceleration of the overall rate of productivity change, (2) an increased concentration of productivity gains in a select group of industries, and (3) a change in the qualitative impact of productivity increases on the occupational and skill structure of the demand for labour.[7]

The effect of productivity changes on employment will depend

on the distribution of price changes and price elasticities.

> "Greater than average productivity increases in a particular establishment or industry will lead to the displacement of labour, if the demand for its product or service is inelastic with respect to price, or if reductions in relative costs per unit are not passed on to the consumer in the form of quality improvements or commensurate declines in relative price. Employment will rise in establishments or industries with greater than average productivity increases if demand is price-elastic, and if prices are reduced. However, labour displacements may then occur in less technologically progressive industries producing substitute goods. Workers losing specific jobs will experience a certain number of weeks of unemployment while hunting for a new job. Consequently, taking all possible combinations of these events into account, it is often assumed that all other things being equal, the higher the increase in output per man-hour, the higher the unemployment rate."[8]

Productivity increases can lead to higher unemployment if they are concentrated in sectors (1) where the price elasticity of demand is low or the benefits of the productivity increases are not passed on to the consumer, and (2) where demand is sensitive to changes in price, but increases in output occur at the expense of closely competitive industries producing substitute goods. If this is the actual situation, the duration of unemployment may also be expected to lengthen since the concentration of layoffs will affect high-seniority workers with low mobility and high-surplus labour market areas may develop.[9]

The distribution of income elasticities, too, will determine the actual rate of displacement. If those industries which experience the greatest productivity gains also have high income elasticities of demand, the rate of displacement may actually be quite low. On the other hand, if the employment effect of increased income is concentrated in the industries with negligible productivity changes, the displacement effect will not be reduced.

Charles C. Killingsworth has argued that this latter case in effect represents the situation in the North American economy.

> "When a labor-saving invention is introduced in an industry which is in its rapid growth stage — its adolescence —

> the invention may help to spur further rapid growth, especially through price cuts, and total employment in the-industry may increase substantially. This is the historical pattern which prompts many people to argue that 'machines make jobs.' But the fact is that when an industry has reached maturity — for example, when there is already one car for each three people — it just is not possible to achieve further dramatic increases in sales, even with the largest price cuts within the realm of reason. The improved productivity made possible by labor-saving machines simply enables the industry to keep up with the normal growth of the market while employing fewer production workers."[10]

Killingsworth then proceeded to argue that the mass-producing consumer goods industries, which are most affected by automation today, are faced with relatively saturated markets, while most of the growth occurs in the technologically less affected service industries.[11] From the high technological displacement effect and the relatively low employment effect of increased income it follows that there is a relatively high rate of layoffs in these industries. There are certain barriers to the immediate re-employment of those laid off so that technological or structural unemployment results. Killingsworth's case is plausible, but its quantitative significance for unemployment has not been demonstrated, nor was evidence provided for the assertion that the industries in which automation is concentrated face saturated markets.

According to the foregoing analysis, if productivity increases were evenly distributed among all industries and enterprises and if the price elasticities, the cross elasticities and the income elasticities for all were the same, there should be no structural or technological layoffs. Technological change, however, may result in new and different requirements for labour. Knowles and Kalacheck refer to it as the qualitative impact of technological change.[12] New skills and occupations will experience increasing demand, while obsolete types of labour are laid off. The unemployment which such changes in the occupational and skill structure of demand precipitates is often regarded as the most serious, since it requires the conversion of the labour that a worker can offer before he is re-employed. It is likely to be of particularly long duration.

In addition, Richard G. Lipsey has argued that technological change can lead to a redistribution of income which in turn can affect the level of employment. If it redistributes income from wage-earners in general to profit-earners and from unskilled workers in particular to skilled workers, and if the beneficiaries of technological change have a lower propensity to consume than the unskilled workers, then aggregate demand will be reduced.[13] Unemployment which is created by this process must, however, be regarded as demand-deficiency unemployment, since it can be eliminated by stimulating aggregate demand.

3. Evaluation

The major merit of the causal approach to the determination of structural unemployment is that it puts its finger on those forces which bring about labour displacement but which do not emerge from a reduction in aggregate demand. It points out that the dynamism of an economy can lead to layoffs and unemployment. It has, however, the serious shortcoming of neglecting the relationship between structural displacement and structural unemployment. It does not analyze the forces determining the rate of hiring, which is just as important as the rate of displacement in the determination of structural unemployment.[14] In other words, structural adjustment, which has the opposite effect to structural displacement, is ignored.

There seems to be the implied assumption that the labour market has only a limited capacity for adjustment and, that when overloaded by structural changes, it permits a significant amount of non-demand-deficiency unemployment to be deposited. On the basis of this assumption, we should expect structural unemployment to increase during a period of rapid growth, since it is likely to be accompanied by rapid technological change and shifts in consumer demand. Yet, the Canadian Senate's Committee on Manpower and Employment contended that maladjustments increase during periods of *slow* growth.[15] This was attributed to a "lagging rate of adjustment." The implied assumption in this case seems to be that structural changes are more or less independent of the rate of growth and that the labour market's ability to adjust supply to demand is adversely affected by slow growth. This may be so if the mobility of labour is reduced under such conditions. Conversely, the adjustment capacity of the labour market may be higher during a period

of rapid and extensive structural change when a high pressure of labour demand may be acting as a stimulant to retraining and labour mobility.

All this raises the question of how effective the adjustment mechanism of the labour market is. This is discussed under the structural maladjustment approach to the theory of structural unemployment.

B. THE STRUCTURAL MALADJUSTMENT APPROACH

1. Definitions

The essence of the structural maladjustment approach is given by its definitions of structural unemployment. While, in general, they also refer to structural changes in the economy as the cause of unemployment, they concentrate on the imperfections and rigidities in the labour market's mechanism of adjustment between supply and demand and the manifestations thereof. The following three complementary definitions are examples of this approach.

In the study of Frank T. Denton and Sylvia Ostry, structural unemployment has been defined as "long-duration unemployment arising from structural changes in the character of demand for labour which require transformation of the labour supply, a time-consuming process."[16] A similar, but less precise, definition has been offered by the Senate Committee on Manpower and Employment: Structural unemployment "is attributed to the failure of the economy to adjust at a sufficient rate to changing circumstances."[17]

The definition provided by Pierre-Paul Proulx is more static. It does not explicitly refer to structural changes and the adjustment process, but focuses on the manifestations of structural imbalance at any one point of time. It describes structural unemployment as "long lasting unemployment due to a mismatching between the education, training, skills, locations, age and sex of work seekers and the requirements of employers."[18]

These definitions are certainly more useful for the analysis of structural unemployment in that they refer not only to the disequilibrating elements of structural change, but also to equilibrating elements in the adjustment mechanism of the labour market. One might say that they concern themselves with the "net disequilibrium" re-

maining after the adjustment mechanism has absorbed as much of the disequilibrating effect as possible.

Proulx's definition is particularly helpful for two reasons: (1) It clearly conceptualizes the net disequilibrium of the labour market. (2) If the necessary statistics are available, it can be readily quantified.

One objection must be raised, however, to the reference to *long-duration* unemployment in the Denton-Ostry and the Proulx definitions. Structural unemployment may just as well be of short duration, if there is a high rate of structural displacement but at the same time a relatively rapid rate of labour reabsorption. Those displaced will be unemployed for some fairly short period before being re-employed elsewhere. They are, nevertheless, structurally unemployed.[19]

2. The Labour Market Adjustment Mechanism

The concept of mismatching, as used by Proulx, is based on the assumption that the substitutability of different types of labour is imperfect, limited or non-existent. In the extreme case, the supply of the different types of labour is fixed and the proportions in which they are demanded are rigid. However, this assumption of rigid complementarity and complete non-substitutability does not correspond to the real world. As a matter of fact, it is probably more illuminating to regard structural imbalance as due to lags and imperfections in the process of substitution both on the demand and supply sides of the labour market.

a. A neoclassical sketch of the adjustment mechanism

Before discussing the barriers and frictions in the substitution process, it is perhaps best to review its theoretical workings. This is provided by the neoclassical theory of the factor market. Substitution is responsible for equilibrium between factor demand and factor supply. If there is a shortage of factor A and an excess of factor B, the price of A will increase relative to the price of B. This leads to three forms of substitution:

(1) The prices of goods and services whose production and rendering involve a high utilization of scarce factor A and a low utilization of surplus factor B will rise relative to the prices of goods and services with a factor mix emphasizing surplus factor B and

de-emphasizing scarce factor A. Consequently, consumers will substitute a goods-and-services mix which requires a higher utilization of B and a lower utilization of A for the current consumption mix.

(2) In response to the changed structure of returns for factor services, factor owners and factor producers will substitute scarce factor A for surplus factor B in the mix of factors supplied. As the price for B declines, a smaller quantity of B will be supplied. Conversely, as the price for A rises, a larger quantiy of A will be supplied.

(3) Because of the changed structure of factor prices, producers will substitute technological processes involving a higher utilization of B and a lower utilization of A for prevailing processes.

Different types of labour can be regarded as different factors of production. If, for example, as a result of technological change skilled labour forms a bottleneck and there is unemployment among unskilled labour, the wage rate of skilled labour relative to that of unskilled labour will rise. The prices of goods and services with a relatively high utilization of skilled labour, such as the production of radios, will rise relative to those of goods and services with a relatively high utilization of unskilled labour, such as clothing. Thus more clothing and fewer radios will be bought. In the meantime, the producers of radios will investigate and possibly introduce production techniques using less skilled labour and more unskilled labour. Finally, labour itself will convert its unskilled services into skilled services through education and retraining. These forces can, according to neoclassical theory, be expected to work toward an equilibrium in the demand and supply of different types of labour.

b. Factors impeding adjustment

(i) *Non-economic impediments:* If the neoclassical adjustment mechanism explains the elimination of labour bottlenecks and structural unemployment, then their persistence must be explained in terms of imperfections in this adjustment mechanism. Lowell E. Gallaway, in his analysis of the intra-factor allocation of the labour market, has listed five barriers to the mobility of labour necessary for the equalization of wage rates and has analyzed them with respect to their effect on unemployment. The imperfections are:

> "(1) the existence of non-economic barriers to mobility of workers; (2) the existence of positive private economic costs associated with the movement of labor from sector

to sector; (3) non-homogeneity of the labor units involved; (4) a failure of workers to maximize their utility function; and/or (5) differences in workers' preference functions."[20]

According to Gallaway, only non-economic impediments to wage equalization may cause structural unemployment. They are the non-economic barriers to mobility and non-maximization of workers' utility. Non-economic barriers to mobility are those that cannot be explained in terms of market forces. They may keep unemployed labour either from filling job openings or from bidding down wages to expand employment opportunities. The same occurs when there is non-maximization of workers' utility, which means that the actions of the workers are inconsistent with their respective (subjectively determined) leisure-income preference functions.[21]

In addition, nonhomogeneity of labour may lead to unemployment. It "may be either of a type that completely excludes a worker from certain labor markets (such as a worker of below-normal intelligence being excluded from becoming a member of the medical profession) or of a type that can be overcome at some positive private opportunity cost (such as the cost of education)."[22] Gallaway claims that in the case of opportunity costs no involuntary unemployment will be involved, while complete exclusion may bring about unemployment.

Another barrier to the prevention and elimination of structural unemployment is insufficient knowledge about available jobs. It is by no means necessary to assume perfect knowledge as a condition of structural equilibrium (although it is for the optimum allocation of labour), but merely enough information for every unemployed to know of at least one acceptable vacancy within his reach — assuming there is no demand-deficiency unemployment.

(ii) *Economic impediments:* According to Gallaway, economic barriers do not lead to unemployment.

> "If the barriers to mobility are economic in origin (i.e., generated by private opportunity costs associated with labor market transfer), an equilibrium may be reached which reflects the objective opportunity costs implicit in these barriers. For example, the cost involved in moving from one geographic area to another, or the cost involved in acquiring the skills necessary to enable a worker to move from one sector to another, may justify the existence of a wage

differential even though workers otherwise move with complete freedom from sector to sector. *Under these circumstances no involuntary unemployment would exist.*"[23]

Risks and uncertainty, however, may provide effective economic barriers to the movement of unemployed labour in unfilled vacancies, as Ernst W. Stromsdorfer has pointed out.[24] Uncertainty may occur regarding the availability of jobs, their remuneration, and the accompanying psychic income in a new location or for a new skill. It may affect the decision to retrain or to move and is likely to act as a deterrent to mobility. In addition, the existence of positive private opportunity costs of transfer or retraining may not be overcome if the opportunity costs exceed the means that the unemployed has available to pay for the improvement, conversion or transfer of the labour services he can offer.[25]

Furthermore, Richard G. Lipsey has pointed out that unused factors might not be absorbed if the price which makes them employable is below the subsistence level, or if it is not technically possible or economically worthwhile to adjust production processes so that all available factors are used. The latter instance is quite possible if the new combination of factors requires scientific and technological research, which, however, yields less returns than research in other areas.[26]

(iii) *The time required for adjustment:* It must have become obvious by now that the various barriers referred to are effective only for a certain period of time. The uncertainty factor, for example, will be effective only in the short run, while the difficulties in changing to production processes with the appropriate factor proportions are likely to persist for a fairly long time. Given a certain structural shock which upsets the labour market equilibrium, all barriers are likely to become negligible in the very long run as they are worn down or circumvented by the forces of adjustment mentioned above, i.e., substitution in consumption, factor input and factor supply. It is, therefore, the time element in adjustment or, rather, the rapidity with which adjustment takes place, which ultimately determines the effectiveness of the adjustment mechanism.[27]

c. Factors facilitating short-run adjustment

Adjustment in the labour market is, in the short run, facilitated by several factors, some of which have been discussed by Walter

Y. Oi,[28] M. W. Reder[29] and Stromsdorfer. They involve incentives to workers to move and to retrain and to employers to provide retraining as well as to modify their demands with respect to the qualifications of job applicants.

(i) *Incentives to the workers:* The incentives to workers to convert their services (for example, geographically, by moving from one place to another, or occupationally, by acquiring additional skills) are provided by the structure of wage differentials, i.e., the difference between what he earns now and what he could earn after the conversion of his labour services. In the case of the unemployed, it is the difference between the unemployment insurance payments and the prospective post-conversion earnings.

The cost of conversion has been treated by Oi and Stromsdorfer as an investment expenditure. Stromsdorfer has put it succinctly as follows:

> "In making the decision to invest or not, the worker... must compare two alternative streams of expected income. The first is the one the worker receives now that his skills are relatively obsolete; the other is the one which can potentially be gained if the worker . . . undertakes the time, expense, and risk of investing. The decision to invest will be made on the basis of the greater income stream, discounted to the present and summed. An act of mobility or immobility will occur."[30]

In other words, (1) the higher the differential in earnings, (2) the lower the costs of conversion, (3) the longer the period of expected future income, and (4) the lower the uncertainty of the calculation, the greater will be the net incentive for mobility. (This, by the way, provides a purely economic explanation for the low mobility of older workers.) The importance of psychic income and institutional factors, however, are not considered here.

(ii) *Incentives to employers for the conversion of labour services:* The labour market provides incentives for the conversion of labour services not only to workers, but also to employers. In his theory of wages and employment based on the treatment of labour as a quasi-fixed factor, Oi has pointed out that the employer can invest in his employees in the form of retraining. He will be maximizing expected returns as long as the present value of the expected increase in the marginal revenue product of labour attributable to

the retraining is at least as high as the present value of future wage payments plus the cost of retraining. Thus, a worker retrained at company's expense will receive a wage lower than his marginal revenue product.[31]

Oi mentioned, however, that this applies only to specific training, i.e., training which is not likely to be applicable to jobs in other firms; otherwise the worker could subsequently bid up his wage by threatening to switch jobs or by actually doing so.[32] Consequently, retraining of a more general nature will not be undertaken by the firm without immediate recompense by the worker or the government.

(iii) *Modification of job qualifications:* Not only will employers accept inferior workers in order to train them, but in a shortage they will actually operate with inferior labour. Reder has conceived of a trade-off between the quality of the hired worker and the period of search for a worker during which the job remains vacant. Since job vacancies represent forfeited returns to the employer, he will try to minimize the vacancy period as well as maximize labour quality. During a time of labour shortage the same quality of labour can only be found after a longer vacancy period than under slacker conditions. Consequently, in order to keep his vacancy period down, the employer is likely to make some compromise in labour quality.[33] This assumes, of course, that such substitutability is technically feasible even in the short run.

d. The implications for the rate of adjustment

What does the neoclassical theory together with the elaborations and qualifications presented above tell us about the rate of adjustment of the labour market, i.e., the rate at which unemployed labour is reabsorbed? Actually, it tells us very little. What it does do is point out the forces at work; those which push toward the equilibrium and those which push away from it. The relative strength and speed of these forces, however, are not analyzed.

In general, the rate of adjustment, in neoclassical terms, depends on the rates, with respect to time, of consumer substitution, substitution among the labour services supplied by the workers, and substitution among the labour services demanded by employers, in response to imbalances between the structures of labour demand and supply. The rate of consumer substitution will depend largely on the flexibility of prices and on the extent and rapidity of the response of demand

to changing prices. The rate of substitution by workers of one kind of labour service for another will be mostly determined by the flexibility of wages and the movement and conversion of labour in response to changing employment opportunities and wages. These in turn depend upon the knowledge of supply conditions by employers and the knowledge of vacancies and the wage structure by workers, as well as the certainty about such knowledge. Institutional barriers, lack of knowledge and uncertainty, reduce the rate of labour substitution. On the other hand, if Reder's theory of the "ladder effect" is widely applicable, the possibility of upgrading and downgrading job qualifications should greatly facilitate labour substitution. Adjusting changes in the employers' requirements regarding worker qualifications will depend in the short run on flexibility in the techniques and organization of production and in the long run on the availability of alternative techniques.

Before a microeconomic approach, such as the one just presented, can lead to a predictive theory of the rate of adjustment of the labour market, the strength of the equilibrating forces as well as their time lags have to be assessed together with the barriers to them.

3. Manifestations of Structural Maladjustment

Since the different adjustment-promoting and adjustment-impeding forces described in the previous section cannot be individually assessed as to strength and speed, attempts have been made to assess the "net disequilibrium" at any one point of time. What is meant by net disequilibrium or maladjustment or structural imbalance is shown by Barbara R. Berman's model.[34]

a. A model of structural imbalance

This model is based on the extreme assumption that the supply of different types of labour is fixed and the proportions in which these types of labour are demanded are rigid. Such a situation is presented in Figure 2.1.

Two complementary, non-substitutable types of labour are assumed to be involved: skilled and unskilled. The respective supplies of each are represented by the skill endowment point E. The employment of each at different levels of production is given by the employment expansion path ABC.[35] As production expands, employment will be pushed to B. At this point a bottleneck appears in the

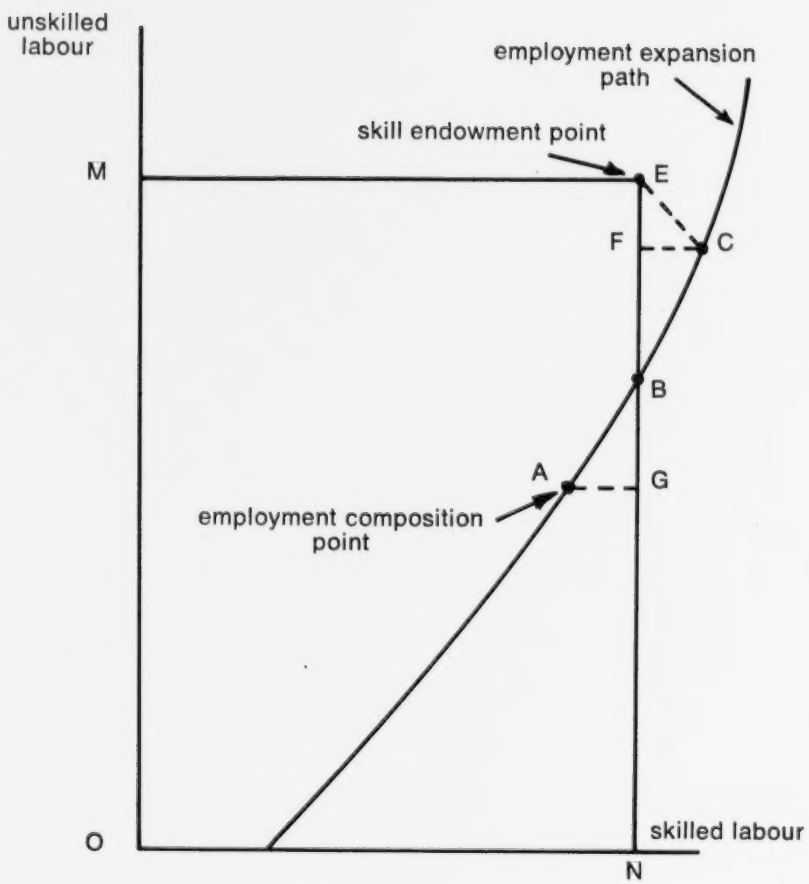

FIGURE 2.1
Berman's bottleneck model: the employment expansion path and the skill endowment constraints

supply of skilled labour, and further expansion cannot take place without increasing this supply. The only unemployment that persists now is among unskilled workers, which amounts to BE. This can be called the level of structural unemployment.[36]

If there were substitutability on the supply side, i.e., unskilled labour could readily convert itself into skilled labour, the skill endowment point would move toward C. If there were substitutability on the demand side, i.e., if employers could easily adjust their production processes to substitute unskilled labour for skilled labour and would be faced with the incentives to do so, then the employment expansion path would move to the left toward E. Full employment requires that the skill endowment point lie on the employment expansion path.

Berman seems to have referred to the employment expansion path as a locus of the *ex post* composition of employment.[37] However, it can also be used as a *labour demand* expansion path in the *ex ante* sense. We can then use it to compare the structure of labour demand with the structure of labour supply. The demand composition point represents the structure of demand and the skill endowment point the structure of supply. The level of full-employment demand is given by C. In the aggregate it is equal to labour supply E, since at C labour demand

$$D = ON + FC + OM - FE$$

and

$$FC = FE$$

so that

$$D = ON + OM = S, \text{ i.e., supply.}$$

The structure of demand, however, is different from the structure of supply. The demand for skilled labour exceeds the supply by FC, while the demand for unskilled labour falls short of supply by the same amount, i.e., FE.

As has been stated above, the level of structural unemployment is BE. It is not FE, which is the number of unskilled workers whose labour services would have to be converted into skilled labour to bring about full employment. The difference between BE and FE is explained by the fact that BF unskilled labour is unemployed, not because of inadequate demand or the possession of inappropriate skills, but because of the unavailability of complementary skilled labour.

This model can be expanded to accommodate any number of types of labour. (The theoretically optimum classification of types of labour would be determined by the pattern of labour comple-

mentarity.) In the extreme case of absolute complementarity among the different types of labour, the level of unemployment reaches its floor as soon as the very first labour bottleneck is reached. Thus, a bottleneck in the supply of inspectors of electronic equipment would indicate that unemployment could be reduced no further.

While this assumption of absolute complementarity is not very realistic, the model does explain the appearance of labour bottlenecks before unemployment has been eliminated and the imbalance in the structure of labour supply and the structure of employment (or demand).

According to Berman's model, the frictional-structural unemployment rate can be estimated to be the minimum unemployment rate at each cycle peak. We would have to assume, however, that there is at least full-employment aggregate demand at each cycle peak. What is more serious is that it is based on the unrealistic assumption of rigid complementarity and complete non-substitutability of labour.[38]

There are, aside from the policy-oriented approach, three other methods by which it is attempted to assess structural unemployment without the extreme assumption of absolute non-substitutability. They are: the level of job vacancies concurrent with unemployment; unemployment differentials among the different industries, occupations, regions, etc.; and the rate of long-duration unemployment.

b. Job vacancies

According to the Berman model, there would be no direct functional relationship between unfilled job vacancies and unemployment. As long as labour demand is B or less, there will be no vacancies. Once it increases beyond B, unemployment will remain constant at its structural level, while vacancies will steadily increase. At full-employment demand, the number of vacancies (FC + FB) will be equal to the number of unemployed (BF + FE). As demand increases further, vacancies will increase correspondingly, while unemployment remains at BE.

J. C. R. Dow and L. A. Dicks-Mireaux, however, have empirically demonstrated that there is a recognizable inverse relationship between unfilled job vacancies and unemployment.[39] The shape of the unemployment-vacancy function is given in Figure 2.2(a). The functional link between the two variables is the demand for labour.

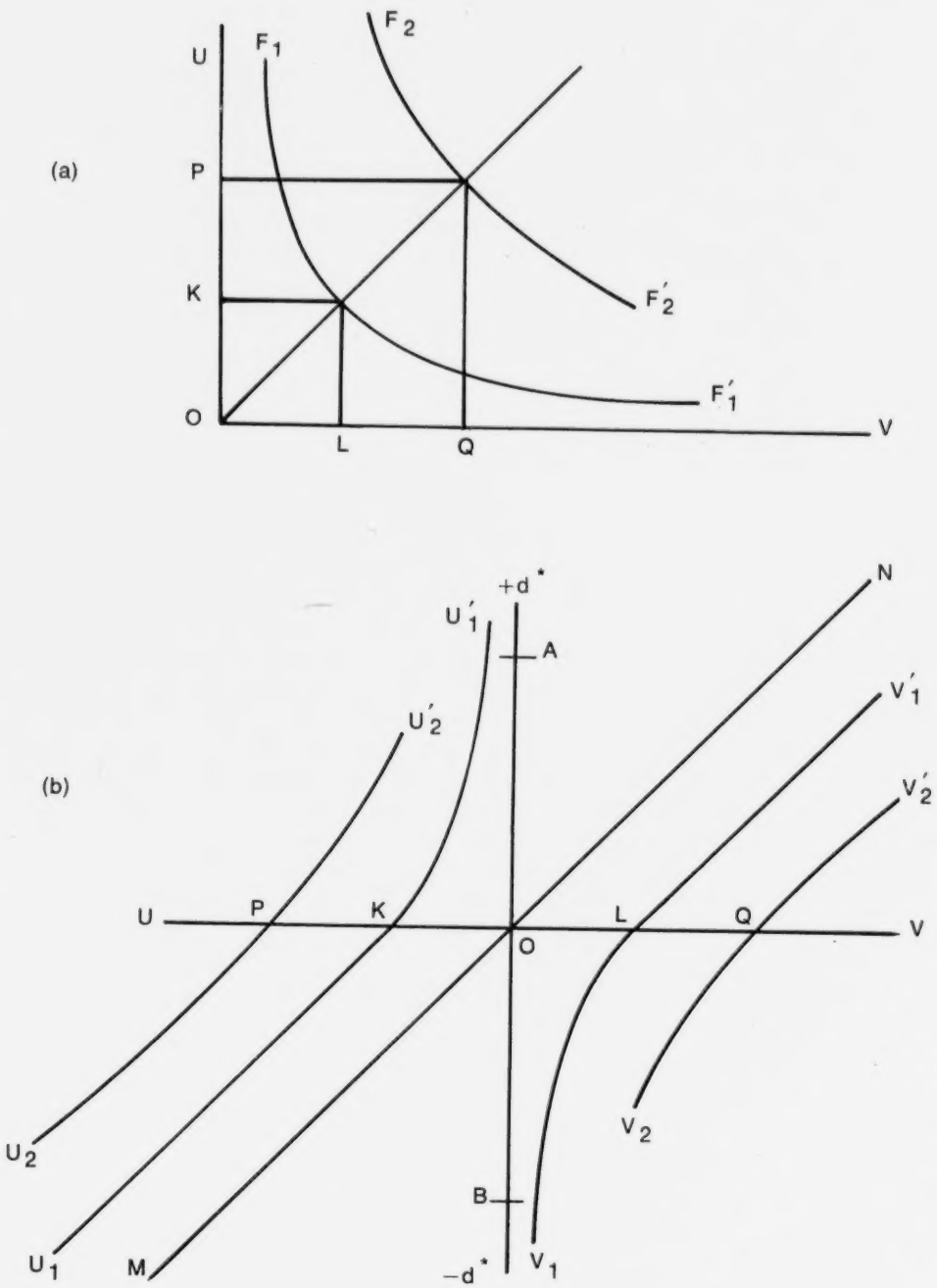

FIGURE 2.2
The Dow-Dicks-Mireaux system of functions: (a) the unemployment-vacancy functions; (b) the unemployment-demand and vacancy-demand functions

The relationship between labour demand, on the one hand, and unemployment and vacancies, respectively, on the other, is given in Figure 2.2(b).[40]

The shape of the functions U_1U_1' and V_1V_1' is based on the following assumptions:

(1) As demand increases from deficient demand to adequate demand ($d^* = 0$), unemployment decreases as rapidly as demand increases. In other words, the number of unemployed decreases by as much as the number of workers demanded increases.

(2) As demand increases further and comes to be in excess, unemployment is reduced at a *decreasing* rate. This might be attributed to the fact that the pressure of demand becomes increasingly futile as it runs into the increasingly severe unemployability of the remaining unemployed.

(3) As excess demand shrinks, the decrease in vacancies is as rapid as the decrease in demand.

(4) As demand falls below $d^* = 0$, vacancies are reduced at a *decreasing* rate. This might be attributed to the persisting difficulty in filling highly specialized vacancies even during periods of relatively high unemployment. The only explanation that Dow and Dicks-Mireaux give for the asymptotic tails of the unemployment and vacancy functions in quadrants II and IV is that unemployment and vacancies "cannot shrink below zero" and therefore "must be supposed to become decreasingly sensitive" as they approach zero.[41]

At the point where unemployment is equal to the vacancies, there is neither net excess demand nor net deficient demand ($d^* = 0$). This is a definition, not a conclusion. Furthermore, "maladjustment" is defined as the amount of unemployment at this level of demand.[42]

It is this maladjustment, or the structural imbalance of the labour market, which accounts for the concurrent existence of unemployment and vacancies. If there were no structural imbalances at all, if the labour market adjustment mechanism operated perfectly, then the unemployment function would be MOA and the vacancy function BON, where MN is the 45° line.

Structural unemployment can be taken to be equal to Dow's and Dicks-Mireaux's "maladjustment" measure. It could be measured, however, at only one level of net demand for labour, i.e., $d^* = 0$.[43] When there is excess demand, unemployment will be reduced *below its structural level*. Thus, according to this model, non-demand-

deficiency unemployment can vary with the pressure of excess demand.

If the degree of maladjustment increases, the unemployment and vacancy functions in Figure 2.2(b) will shift outward. Assuming that the degree of maladjustment increases from $OK = OL$ to $OP = OQ$, then the functions will shift to U_2U_2' and V_2V_2', respectively. The unemployment-vacancies function F_1F_1' in Figure 2.2 (a) will shift to F_2F_2'. Thus a non-cyclical change in unemployment will be reflected in a shift of the unemployment-vacancy function, while a cyclical change involves a movement along the function.

The difficulties with this approach are (1) the general inadequacy of vacancy data and (2) the fact that the hyperbolic shape of the unemployment-vacancy function is assumed rather than obtained by deductive or inductive analysis. Nevertheless, because it uses variables directly related to the labour market rather than proxies, and because it provides a measure of structural unemployment that can be applied at any phase of the cycle, it deserves further development. In Chapter III a theoretical explanation for the function will be given and in Chapter IV it is applied to Canadian data after the vacancy rate has been estimated.

c. The structure of unemployment

(i) *The basic argument:* The comparison over time of unemployment rates of the different groups of the labour force, e.g., industries, occupations, regions, education levels and age-sex groups, has been a favourite technique of the participants in the structural-unemployment controversy for ascertaining changes in structural unemployment. This approach can be divided into two methods: (1) the comparison of the unemployment rates of specific groups, and (2) the comparison of the overall dispersion of unemployment rates among the various segments of the labour force.

The structuralist hypothesis has been interpreted by several economists to mean that structural unemployment is concentrated in (1) blue-collar occupations,[44] (2) goods-producing or manufacturing industries,[45] (3) groups with relatively little schooling,[46] (4) higher age groups,[47] and (5) depressed areas.[48] It is generally implied that changes in structural unemployment can be detected from deviations of the respective unemployment rates from their normal relationships to overall unemployment. If the unemployment rates are above those expected on the basis of the relationship to the overall-unemployment

rate, it is considered to indicate an increase in structural unemployment, and if below, then a decrease. This conclusion, however, requires the restrictive assumption that increases in structural unemployment are more concentrated in the above labour force groups than are increases in demand-deficiency unemployment.

The alternative approach has been to ascertain whether the correlation between the unemployment rates of the various labour force groups has deteriorated over time, which, according to Gallaway, would indicate an increase in structural unemployment.[49] While this approach avoids the need to specify the structurally disadvantaged groups, it requires the assumption that the distribution of increases (or decreases) in structural unemployment among the labour force groups is significantly different from the distribution of increases (or decreases) in demand-deficiency unemployment.

(ii) *The structure of unemployment and the cycle:* It has been empirically established that the unemployment impact of cyclical fluctuations is not randomly distributed among the various labour force groups. The differences in the impact can be largely explained by two phenomena: (1) Since the short-run income elasticities of all goods and services are not the same, there will be a differential impact of the cycle on the various industries. (2) The firms will not lay off different types of worker in proportion to the composition of their work force.

The reasoning for the second point has been developed by Oi and Reder. Oi has argued that there are certain fixed costs involved in the employment of labour. They arise from the costs of hiring and of training. The expected marginal revenue product of labour has to cover not only the wage rate but also the amortization of the initial fixed costs, or the periodic rent, as Oi called them. Since in the short run the periodic rent does not enter into employment decisions, a decline in the product price and therefore in the marginal revenue product does not lead to lay-offs until it is greater than the periodic rent. Consequently, the greater the ratio of periodic rent to wage rate, the more insensitive employment will be to price changes.[50]

Since abundant types of labour, such as unskilled workers, presumably involve relatively lower fixed employment costs than scarce types of labour, such as skilled workers, their employment will be more sensitive to declines in product demand than the employment of scarce labour. On this basis, cyclical unemployment will be pre-

dominantly composed of labour which has little specific training and is the most readily available.

Reder has advanced a similar argument by referring to the "ladder effect": ". . . as overall unemployment rises, the unemployed from higher occupational strata back down into the unskilled ranks displacing unskilled workers, increasing the relative unemployment rate of the unskilled and reducing that of the skilled."[51] This works in reverse when unemployment falls. Workers will be re-employed in more or less the reverse order in which they were laid off.

Having established the cyclical pattern of the structure of unemployment, however, this does not mean that the structure of unemployment resulting from demand deficiency can be distinguished from the structure of unemployment resulting from structural changes in the economy. Lipsey has made this point very strongly and has argued that it is only in the period of recovery that non-cyclical changes in the structure of labour demand become apparent in the new hiring pattern, since structurally displaced jobs will not re-emerge with the expansion.[52]

If, for example, structural changes have the same impact on the structure of unemployment as demand deficiency, the two effects cannot be separated. As a matter of fact, it is conceivable that structural changes may affect the structure of unemployment in an equalizing way, which would then have to be interpreted as a reduction in structural unemployment, whereas in effect an increase took place.

d. Long-duration unemployment

A number of definitions have explicitly defined structural unemployment to be long-duration unemployment, i.e., the proportion of the labour force which has been unemployed for at least some long period of time. Such a definition would require either (1) assuming that the causes of mismatching of demand and supply necessarily lead to only long-duration unemployment or (2) arbitrarily defining short-duration unemployment associated with the mismatching of demand and supply as frictional unemployment.[53]

(i) *Random distribution of unemployment durations:* Not all long-duration unemployment is necessarily structural. Whether or not long-duration unemployment is to be expected as a natural concomitant of *any* type of unemployment depends on the assumptions about the flow into and out of unemployment. For example,

if the movement out of unemployment followed the first-in-first-out system, all unemployed would experience approximately the same length of unemployment.

Berman adopted the more realistic assumption "that, once in the state of unemployment, people get to go through the exits according to a stochastic process. We can imagine a lottery in which for any period there are $_0U$ winning tickets out of a total of U tickets and our assumptions mean that everyone has an equal chance of getting a winning ticket of $_0U/U$."[54] On the basis of this assumption, the expected average duration of unemployment (or the proportion of unemployed who have been unemployed for at least some given period) will be greater the lower the turnover rate of the unemployed is. By comparing the distribution of the duration of unemployment which is to be expected on the basis of the turnover rate (or the unemployment rate, since the turnover rate and the unemployment rate have been found to be highly correlated)[55] with the actual distribution we can assess how far reality deviates from the assumption of homogeneity within the labour force and among the unemployed.

(ii) *The relative deterioration of the skills of the long-duration unemployed:* N. J. Simler has come up with a theory of long-duration unemployement which rejects Berman's assumption of a random movement of persons out of the unemployed group. His argument is the following:

> "A hard core of long-duration unemployed workers will emerge if the probability of re-employment is a decreasing function of the duration of unemployment. Among other reasons, this will be the case if the skill level of unemployed workers is also a decreasing function of the duration of unemployment, and if the structure of wages fails to adapt to the changing structure of skills; or if the unemployed workers' skills remain intact but do not advance with the increasing level of skills of the employed labour force; or if the wage structure fails to adjust to the changing skill structure. Either way, the gap between the potential productivity of the unemployed and the actual productivity of the employed widens with time; and, therefore, the probability of re-employment diminishes with time. Under these conditions, the chance of a hard core of unemployed workers developing becomes greater, the longer the unem-

> ployment rate fluctuates between U_1 [the usual recession rate] and U_2 [the recession rate during slow long-run growth], for with each succeeding cycle the flow into the category of very-long-term unemployment exceeds the flow out of it."[56]

The groups which Simler regarded as most vulnerable to skill decay are the older workers and those with relatively little education. The latter, for example, would have just as much chance of getting laid off as any other labour force group. "But when aggregate demand expands and unemployment falls, they have less chance of becoming re-employed than other workers, and their prospects diminish the longer they remain unemployed."[57]

Simler applies this imbalance also to older workers by assuming "that layoffs among workers of equal skill are made in a random fashion and not on a last-in, first-out basis."[58] First of all, this contradicts the conclusion to be derived from Reder's more reasonable assumption regarding the ladder effect, which does mean a last-in-first-out approach. Secondly, it makes the unreasonable assumption that older workers are randomly distributed among the different skills. In reality, older workers are more protected against unemployment than younger workers. However, Simler's contention that older workers, once unemployed, have less chance of being re-employed seems realistic. This might be explained on the basis of higher retraining costs for older workers than for younger workers to achieve the same increment in the marginal labour product, and possibly of the shorter time horizon of the investment in older workers.

At any rate, the relative deterioration of the skills of the unemployed provides one reason why actual long-duration unemployment is higher than is expected on the basis of Berman's assumption of random re-employment. It explains how "persistent and long-term, or structural, unemployment — as distinct from temporary and short-term, or frictional, unemployment — can emerge in the first place . . ., can increase relative to all other unemployment . . ., and can become increasingly concentrated among older workers . . . without there having occurred a structural change of any kind whatsoever."[59]

Thus a rise in long-duration unemployment at a constant (high) level of unemployment may be non-structural in the causal sense. But it would be structural in the descriptive sense, since the relative deterioration of the skills of the long-duration unemployed means

that the demand and supply structures will be increasingly mismatched. Whether it can be described as structural from the point of view of the appropriate policy action will emerge from the following section.

In conclusion, it can be said that the proportion of long-duration unemployment in total unemployment may reflect the level of structural unemployment, but it will also vary with demand conditions. Only after the cyclical pattern in this ratio has been removed can it be regarded as an index of structural unemployment. Even then it does not actually specify the proportion of the unemployment rate which is to be regarded as structural.

4. Evaluation

The structural maladjustment approach is the necessary complement of the causal approach in the theoretical illumination of the structural unemployment problem. It shows how the market's equilibrium mechanism absorbs disequilibrium created by structural shocks and the resulting displacement of labour. It also indicates the factors that impede this process of structural adjustment.

However, the methods that have been developed to assess the level or trend of structural unemployment leave much to be desired. Berman's bottleneck model is to be seen as an illuminating device rather than a method for measuring structural unemployment. The analysis of changes in the structure of unemployment turned out to be of doubtful value in assessing the trend in structural unemployment because of the problems of distinguishing between the structure of demand-deficiency unemployment and that of structural unemployment. As a matter of fact, it was demonstrated that under certain conditions, and using this method, the effects of an increase in structural unemployment would be interpreted as a reduction in structural unemployment. A similar problem emerges in the use of the relationship of long-duration to overall unemployment, since long-duration unemployment can just as well stem from prolonged demand deficiency as from severe structural dislocation.

The one approach which merits further attention is that involving the use of job vacancy data. It is derived directly from the concept of structural labour imbalances. Its important shortcoming, from the point of view of theory, is the lack of an explanation about the underlying processes. Nevertheless, in the model in Chapter III, this

approach is used as the basic framework and it is attempted to eliminate this shortcoming.

C. THE POLICY APPROACH

The third set of theories of structural unemployment is the policy-oriented group. Their use has been justified by Berman as follows:

> "Since the structural unemployment controversy is (or should be) basically a policy controversy, it would seem natural to construct a definition in terms of the results of policy actions. We can then try to predict what effects various policy actions might have, and our predictions will at one and the same time serve to measure structural unemployment and light our way along the optimum policy path."[60]

1. The Policy Implications of Berman's Bottleneck Model

On this basis, Berman proceeded to define the different types of unemployment in terms of the policy measures by which they can be eliminated. Her definitions may be presented as follows:

U_d = demand-deficiency unemployment, which can be eliminated by monetary and fiscal policies.

U_s = structural unemployment, which can be eliminated by retraining and other manpower programs (after demand-deficiency unemployment has been eliminated) plus the unemployables.

U_f = the remaining unemployment, which is what Berman calls "rock bottom" frictional unemployment.[61]

In Figure 2.1, which depicts Berman's model, these components can be identified. Structural unemployment is BE, as has been explained above. The remaining unemployment, for example, at A, AG + GB, is demand-deficiency unemployment. (Frictional unemployment is not shown in the diagram.) B is the point where the structural labour bottleneck is encountered, after which fiscal and monetary policies cannot reduce unemployment any further.

> "In order to get an orderly expansion beyond B, the skill mix of the economy needs to be relocated from point E to a point closer to the employment expansion path. Since retraining one person subtracts one from the unskilled

labour force and adds one to the skilled, a retraining program will cause the skill endowment point to migrate in a 45-degree line. Thus, retraining EF people will enable the economy to expand toward point C, and cause additional hiring of BF unretrained unskilled people, as well as FC (= EF) retrained newly skilled workers. Retraining may thus have a "multiplier" effect on employment. Additional demand of ($G.N.P._c - G.N.P._b$) is, however, also a necessary condition."[62]

The major policy question that arises with respect to this model is: At what point must the stimulation of aggregate demand be regarded as becoming ineffective in reducing unemployment? Berman's answer was that this occurs when a bottleneck appears in "some significant sectors of the labour market." How is such a bottleneck to be recognized? The signal for it, Berman suggested, is a heightening of inflationary tendencies. She warned, however, that it must be possible to analytically extract price movements caused by other pressures. She then left this problem with the assumption that "we know how to avoid error in the recognition of labor bottlenecks."[63]

2. Lipsey's Trade-Off Model

a. Model and definition

Inflation as a symptom of labour bottlenecks has been used by Lipsey to construct his inflation-unemployment trade-off model.[64] In Figure 2.3 the trade-off function RR′ describes the behavioural relationship between price changes and unemployment. It "shows combinations of U and $\dot{P}$ which can be attained by varying the level of aggregate demand; generally, the higher the level of aggregate demand is, the lower will be the level of unemployment, but the higher will be the rate of price inflation."[65]

If the policy-makers take the view that unemployment should be minimized within the constraint of some maximum rate of inflation which they are prepared to tolerate, we can, according to Lipsey, distinguish between demand-deficiency unemployment, on the one hand, and structural and frictional unemployment, on the other. Given the behavioural function RR′ and a maximum acceptable rate of inflation of OA, the lowest possible level of unemployment is OD. This is the level of structural and frictional unemployment. Any

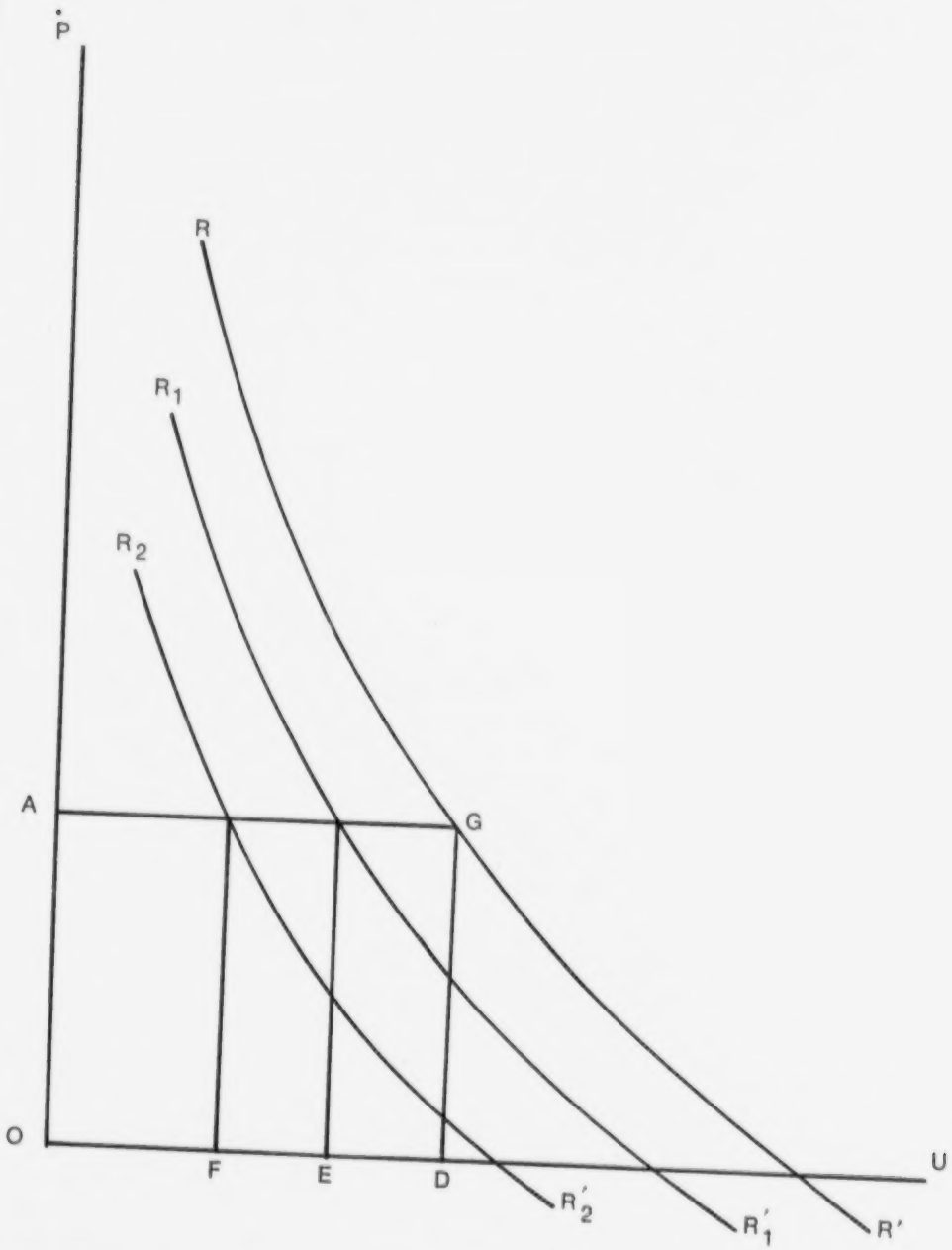

FIGURE 2.3
Price inflation and unemployment: the behavioural trade-off functions and the maximum-inflation constraint

unemployment in excess of that level is attributed to inadequate demand.

Demand stimulation can reduce unemployment only to OD without pushing inflation beyond the maximum acceptable rate. To reduce unemployment below OD, selective measures would have to be introduced. First of all, purely from the point of view of the maximization of national product, all such measures will be applied as long as they yield a net return according to standard cost-benefit analysis (where the costs are those of the scheme and the benefits are the discounted value of the increase in output as a result of the scheme). This will shift the trade-off function to the left, to $R_1R'_1$, where, at the maximum acceptable rate of inflation, unemployment will now, after the introduction of selective measures, be OE instead of OD.

If there are social benefits to be derived from a further reduction in unemployment, additional policies can be introduced, yielding a net return in terms of economic and social benefits over the costs to society. These will shift the trade-off function to $R_2R'_2$, leaving a core of unemployment, whose elimination by further manpower policies is not warranted on the basis of economic and social cost-benefit analysis. In other words, $R_2R'_2$ represents the curve where the marginal social returns equal the marginal social costs of the manpower policies. In this case, OF is frictional unemployment and FD is structural unemployment. It is apparent that Lipsey's definition differs from Berman's insofar as the unemployables are part of frictional unemployment according to Lipsey, whereas according to Berman they are part of structural unemployment.

Instead of laying down a maximum inflation constraint, however, it is preferable from the point of view of policy-making to think in terms of a trade-off between different goals, namely, full employment and price stability. This means that policy-makers are simultaneously minimizing unemployment and inflation. An example of the relative preference of policy-makers between the two goals is given by the preference functions I_1, I_2 etc. in Figure 2.4, each of which gives the locus of combinations which for the policy-makers is of equal value in terms of the social costs of inflation and unemployment. The closer the preference function is to the origin, the more the goal of minimizing unemployment and inflation will be satisfied. The concave shape of the functions is possible if policy-

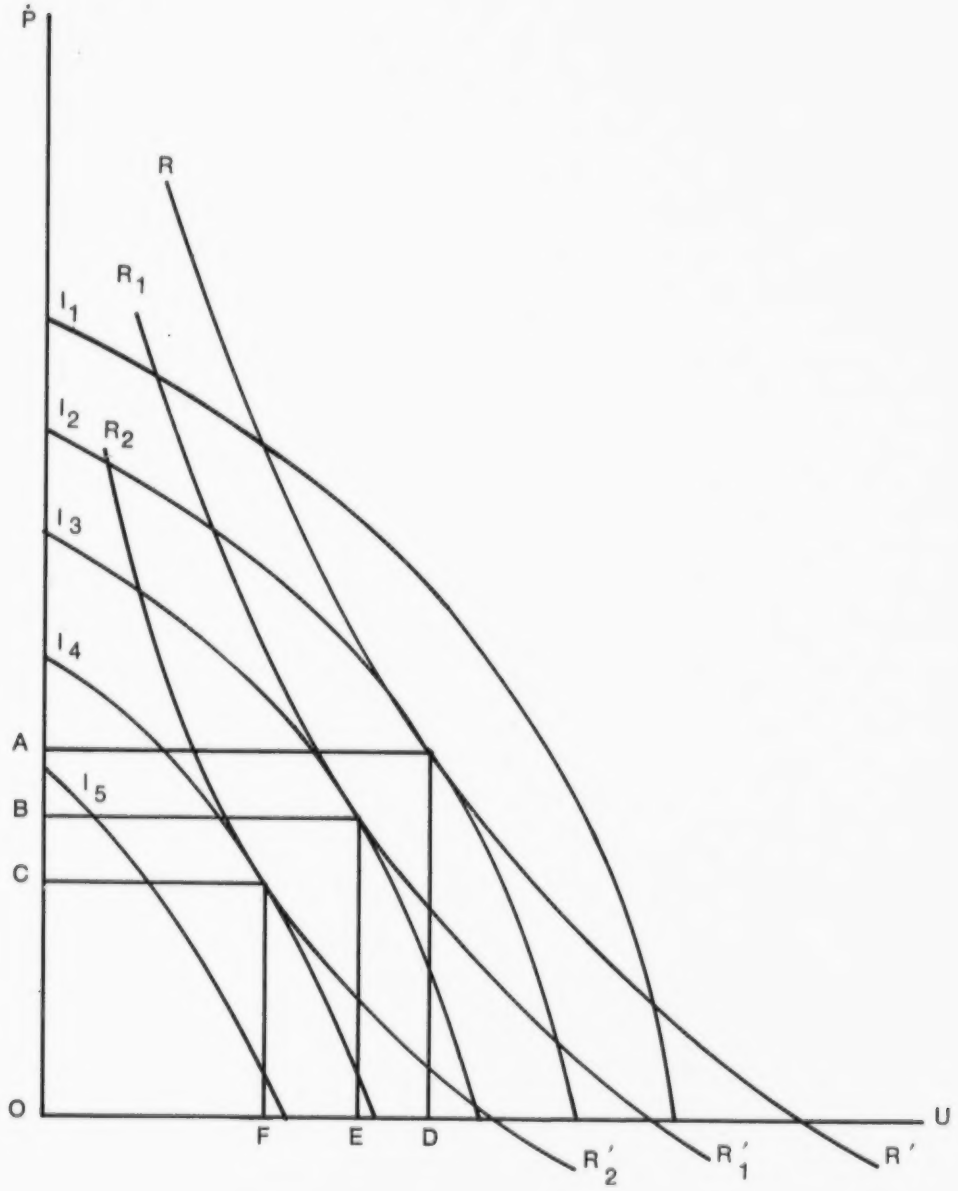

FIGURE 2.4
Price inflation and unemployment: the behavioural trade-off functions and the policy-makers' preference functions

makers are relatively more concerned about unemployment at low levels of inflation and about inflation at low levels of unemployment. The social costs of unemployment and inflation can be minimized in the short run only within the constraint of the behavioural trade-off function RR′. They will be minimized at the point where the lowest preference function, or policy trade-off function, can be obtained by moving along RR′. This is the usual tangency point.

Here demand-deficiency unemployment is unemployment in excess of *OD*. By applying selective policies so that the economic cost-benefit test is satisfied, unemployment can be reduced to OE. Inflation, too, is reduced from OA to OB. On the basis of criteria other than the maximization of national product these policies will be pushed further, so that unemployment will be compressed to OF and inflation to OC. Structural unemployment then is FD and frictional unemployment is *OF*.

As Lipsey has pointed out, "structural and frictional unemployment shade into each other with no clear boundary separating them."[66] If we conceive of frictional unemployment in the widest sense, i.e., as unemployment which is "the product of imperfections in the labour market,"[67] then "structural unemployment is that part of frictional unemployment which is not acceptable either because there would be a net money gain in removing it or because the social gains of removing it are judged to outweigh the net money cost of so doing."[68]

The concept of unacceptability points to the two subjective elements in the analysis: (1) the policy preference functions, and (2) the evaluation of the social benefits from reducing unemployment. The analytical economist, therefore, before he can determine the levels of the different types of unemployment, must either know what the policy preference functions are, or he can present the policy-makers with the RR′ and R_1R_1' functions and data on the returns in terms of re-employment from investment in manpower and other selective policies and then observe the policy-makers' reaction.

b. The theoretical basis

The behavioural trade-off function RR′ is derived from the Phillips curve, which describes the relationship between the rate of change of wages and the level of unemployment. This derivation is based on the assumption that price inflation is closely correlated with

the rate of change of wages. Thus the behavioural trade-off function

$$\dot{p} = f_1(u) \qquad (2.1)$$

where $\dot{p}$ = prince inflation and u = unemployment rate, is based on the Phillips function

$$\dot{w} = f_2(u) \qquad (2.2)$$

where $\dot{w}$ = rate of change of wages, and the assumption that

$$\dot{p} = f_3(\dot{w}) \qquad (2.3)$$

Equation (2.2) was originally formulated and tested by A. W. Phillips.[69] The level of unemployment was regarded as a measure of the demand for labour relative to its supply. The function was expected to take the form of a curve for the following reasons:

> "When the demand for labour is high and there are very few unemployed we should expect employers to bid wage rates up quite rapidly, each firm and each industry being continually tempted to offer a little above the prevailing rates to attract the most suitable labour from other firms and industries. On the other hand it appears that workers are reluctant to offer their services at less than the prevailing rates when the demand for labour is low and unemployment is high so that wage rates fall only very slowly. The relation between unemployment and the rate of change of wage rates is therefore likely to be highly non-linear."[70]

The function describing this relationship is similar in shape to the RR′ function in Figures 2.3 and 2.4 describing the relationship between price inflation and the unemployment rate. This means that any demand-pull effects on the price level must be simultaneously reflected in the wage level.

c. Impurities in the inflation-unemployment relationship

Impurities in the inflation-unemployment relationship may be due to disturbances in equation (2.2) or in equation (2.3). Such disturbances in the Phillips curve may result from cost-push pressure on the wage level or, alternatively, from wage restraint.

One attempt to deal with this problem was to take account, at least, of those changes in the cost-push pressure on the wage level which followed a cyclical pattern but which were not related to the *current* level of labour demand. This involved introducing into the Phillips equation the *rate of change* in unemployment as an additional independent variable. It is based on the argument that the bidding

up of wages by employers and the pressure exerted by unions will also be influenced by expectations about *future* demand conditions and that the rate of change in unemployment is a good indicator of these expectations. Empirically, this variable helped to explain the "loops" that were observed in the Phillips relationship.[71] Lipsey argued that these "loops" were not an expectations effect but the result of aggregating data from various labour markets with different demand conditions.[72] S. F. Kaliski pointed out, however, that neither hypothesis could be rejected.[73] While determination of the effect of the rate of change of unemployment on the rate of change of wages may remove some of the disturbances of the Phillips relationship resulting from varying cost-push pressures on the wage level, it cannot eliminate all of them.

Impurities in equation (2.3) can arise from cost-push and demand-pull factors. The relationship between price inflation and wage changes can be disturbed by such non-wage cost-push factors as changing profit-sales ratios and changing import-price inflation. On the demand-pull side, non-labour shortages of factor inputs may put pressures on the price level without affecting the wage level to a comparable degree.

These impurities in Lipsey's trade-off function do not destroy its meaningfulness. They merely make clear that it relates two variables which interact only in an indirect way and are, therefore, not entirely harmonious.

3. The Policy Implications

a. Policy sequence

According to Lipsey, "in a perfect world, in which policy-makers acted rationally, we would behave *as if* we were deficient-demand theorists and increase aggregate demand until the limit set by acceptable price rises was reached; we would then all behave as structuralists and consider how the remaining unemployment could be removed."[74]

This approach has been criticized from two angles:

(1) As Berman has pointed out, after a cyclical expansion has encountered serious labour bottlenecks, selective policies have to be applied simultaneously with expansionary policies.[75] Otherwise, the skill endowment point in Figure 2.1 is shifted from E to C by selective policies, but the employment composition point is still at B. Sufficient

demand must be assured, therefore, while selective policies make additional expansion possible.

(2) Proulx has argued that selective policies are appropriate even before the labour bottleneck has been reached, since there will be a lag before they become effective. This is particularly significant when "the composition of the marginal demand for labour is so different from the composition of the average demand for labour, and so difficult to predict therefrom, . . . that it is desirable to stress general education, or technical and vocational education for groups or families of occupations (time consuming processes) as against stop-gap and short-run training programs."[76]

b. Trade-off goals

Instead of using the trade-off model with only the policy goals of minimizing unemployment and inflation, Proulx has suggested that the maximization of growth be introduced into the model.[77] "A belief that manpower can make a significant contribution to economic growth, coupled with a belief that selective policies would not be very effective anticyclical weapons, may prompt rational policy-makers who weight growth more heavily than stabilization to opt in favour of a continuous use of selective policies alongside aggregative public policies."[78]

This argument is merely a case, however, for including the effect of selective policies on growth in assessing the value of such policies. The argument that the rate of growth is significantly affected by the economy's particular position on the unemployment-inflation trade-off function is necessary to justify the extension of Lipsey's model to include growth as another trade-off goal of aggregative policy. This argument has been made by Ronald G. Bodkin.[79] On the basis of empirical evidence he came to the conclusion "that the goal of stability of the price level appears to conflict with the other two explicitly considered goals, while the goals of full employment and of rapid economic growth are, if anything, complementary."[80] One possible reason why one might expect a correlation between the rate of growth and the level of demand as indicated by inflation and unemployment is that a high level of demand may provide an inducement for capacity expansion and productivity increases by producing excess demand which producers will try to satisfy.[81] For the purpose of policy formulation, therefore, the

growth objective should probably be included in the trade-off relationship. In this paper, however, no such attempt is made.

One other goal which R. A. Gordon has suggested as important to the maximization of national economic welfare is the balance of payments equilibrium. In the form presented by Gordon, however, it does not complicate Lipsey's trade-off model. He regards it as a constraint rather than an optimizable variable, so that the only implication that the balance-of-payments equilibrium has for the trade-off model is that the minimization of unemployment or inflation has to be suspended while this constraint is being violated.[82] It does not involve an additional trade-off goal.

4. Evaluation

The policy-oriented approach to the measurement of structural unemployment has two important merits: (1) it provides an absolute measure of structural unemployment without requiring vacancy data and (2) it demonstrates how the level of labour demand, on the one hand, and structural imbalances, on the other, affect two variables, both of which are to be minimized according to political criteria.

It has, however, certain drawbacks. Since inflation and unemployment are causally related only in an indirect way, this relationship is likely to contain significant impurities. The relationship between labour demand and the rate of change of wages may not be constant over time and may suffer from disturbances due to wage-push effects. Introducing the rate of change of unemployment is not likely to adequately take account of them. The relationship between the rate of change of wages and price inflation, too, suffers from disturbances due to varying rates of import-price inflation, profit-sales ratios and shortages of production inputs other than labour.[83] Finally, when this model is subjected to regression analysis, the least-squares principle results in a bias according to which as much as possible of the variations in unemployment are attributed to cyclical factors and as little as possible to the unstated structural factors.

FOOTNOTES TO CHAPTER II

[1] Paul H. Casselman, **The Economics of Employment and Unemployment**, Public Affairs Press, Washington, D.C., 1965, p. 115.
[2] H. D. Woods and Sylvia Ostry, **Labour Policy and Labour Economics in Canada**, Macmillan of Canada, Toronto, 1962, pp. 377-8.

[3] Casselman, *op. cit.*, pp. 116-7.
[4] United States, Congress Joint Economic Committee, Subcommittee on Economic Statistics, **Higher Unemployment Rates, 1957-60: Structural Transformation or Inadequate Demand,** 87th Congress, 1st session, 1961, pp. 42-7.
[5] *Ibid.*, p. 42.
[6] *Ibid.*, p. 44.
[7] *Ibid.*, pp. 9-12.
[8] *Ibid.*, p. 10. Actually this statement is not entirely correct. Productivity increases do not need to be above average to lead to labour displacement. If demand is price-inelastic, even a small productivity increase can lead to an employment reduction.
[9] *Ibid.*, pp. 10-11.
[10] Charles C. Killingsworth, "Automation, Jobs, and Manpower," **The Nation's Manpower Revolution,** Hearings before the Subcommittee on Labour and Public Welfare, U.S. Senate, 88th Congress, p. 1468.
[11] *Ibid.*, pp. 1468-9.
[12] U.S. Joint Economic Committee, *op. cit.*, p. 11.
[13] Richard G. Lipsey, "Structural and Deficient Demand Unemployment Reconsidered," **Employment Policy and the Labor Market,** ed. Arthur M. Ross, University of California Press, 1965 pp. 248-9. Lipsey has also argued that structural shifts due to technological change and other factors can set up cyclical swings in aggregate demand and income by redistributing income between groups with different lags in their consumption behaviour.
[14] Knowles and Kalacheck (who, by the way, came to the conclusion that the hypothesis according to which structural unemployment has been on the increase is incorrect) looked also at the labour supply side of the structural unemployment question. They considered the "propensity of unemployed workers to seek jobs in other occupations, industries, and geographic areas" as the fourth macroeconomic determinant of the level of structural unemployment. (See U.S. Joint Economic Committee, *op. cit.*, p. 12). It was not included in the above discussion because it does not fall into the casual approach as circumscribed by the definitions at the beginning of this section.
[15] Canada, Senate, Special Committee on Manpower and Employment, *Final Report, Queen's Printer,* 1961, p. 2.
[16] Frank T. Denton and Sylvia Ostry, **An Analysis of Post-War Unemployment,** Economic Council of Canada, Staff Study No. 3, Ottawa, Queen's Printer, Dec. 1964, p. 2.
[17] Senate Committee on Manpower and Employment, *op. cit.*, p. 10.
[18] Pierre-Paul Proulx, "The Composition of Unemployment in Canada," **Employment, Unemployment and Manpower,** McGill University, Industrial Relations Centre, 15th Annual Conference, June 1964, p. 37.
[19] The duration of unemployment will be further discussed below.
[20] Lowell E. Gallaway, "Labour Mobility, Resource Allocation, and Structural Unemployment," **American Economic Review,** Vol. 53, No. 4, Sept. 1963, p. 696.
[21] *Ibid.*, pp. 696-7.
[22] *Ibid.*, p. 697.
[23] *Ibid.*, p. 696. Italics in the original.
[24] Ernst W. Stromsdorfer, "Labor Force Adjustment to Structural Displacement in a Local Labor Market," **Industrial and Labor Relations Review,** Vol. 18, No. 2, Jan. 1965, p. 152.
[25] It may be argued that a person wishing to finance a retraining course and cover his family's living expenses in the meantime can always take up a loan. However, banks usually regard unemployed workers with obsolete skills as poor risks.
[26] Lipsey, **Employment Policy and the Labor Market,** pp. 253-4.
[27] Gallaway seems to imply that lags in the adjustment process are a basic part of an efficient system of factor allocation. See Gallaway, *op. cit.*, pp. 699-700. But surely the lengths of the lags will determine the degree of disequilibrium that the system will permit. Consequently, the longer the adjustment lags are, the more inefficient the allocation system must be.
[28] Walter Y. Oi, "Labour as a Quasi-Fixed Factor," **Journal of Political Economy,** Vol. 70, No. 6, Dec. 1962, pp. 538-55.
[29] M. W. Reder, "Wage Structure and Structural Unemployment," **Review of Economic Studies,** Vol. 31, No. 88, Oct. 1964, pp. 309-22.
[30] Stromsdorfer, *op. cit.*, p. 152.
[31] Oi, *op. cit.*, p. 540.

[32] *Loc. cit.*

[33] Reder, *op. cit.*, pp. 310-11. Knowles and Kalacheck have given a plausible example of such a compromise. "If, for instance, the growth in the supply of engineers is less rapid than the growth in demand at going wage rates, the use of engineers is economized by providing the average engineer with a greater number of less skilled assistants." (U.S. Joint Economic Committee, *op. cit.*, p. 11, n. 4.)

[34] Barbara R. Berman, "An Approach to an Absolute Measure of Structural Unemployment," **Employment Policy and the Labor Market,** ed. Arthur M. Ross, University of California Press, 1965, pp. 258-60.

[35] The shape of the employment expansion path is derived from Berman's assumption that "the marginal propensity to hire unskilled labour is higher than the average propensity to hire unskilled labour and the marginal propensity to hire skilled labour is lower than the average." See *ibid*, p. 259. However, for the explanation of the structural imbalance between the structure of employment and the structure of supply the shape of the employment expansion path is not important. What is essential is that the employment expansion path is rigid and that it does not pass through the skill endowment point.

[36] *Ibid.*, pp. 258-9. Frictional unemployment, which, according to Berman, consists of the unemployables and "rock bottom" unemployment, is ignored in the model. The precise demarcation between frictional and structural unemployment is discussed below, under the policy-oriented approach. Each type of labour is likely to have its share of frictional unemployment.

[37] See *ibid.*, pp. 258-60.

[38] S. F. Kaliski recently developed this approach into an empirical test of the existence of structural unemployment. ("Structural Unemployment in Canada: The Occupational Dimension," a paper prepared for the Annual Meeting of the Canadian Economics Association, Calgary, June 1968, mimeographed.) Finding the high-skill occupations to have a low elasticity of employment with respect to output, he concluded that "expansions of the magnitude observed in the postwar period can take place without creating much additional demand for highly skilled workers" (p. 30) and therefore "there is not likely to be any occupational structural unemployment [which is defined as unemployment which arises because workers in complementary occupations are unavailable (p. 12)] at the level of aggregation considered" (p. 31). He drew this conclusion in spite of the fact that he had recognized that "it is in practice unlikely that skill bottlenecks will constitute an absolute bar to any further expansion of output beyond the point of 'full demand'. They are more likely to permit expansion only at increasing cost resulting in price and possibly wage inflation" (p. 10). He ignored completely the fact that this inflation will trigger deflationary policies which bring to a halt the further reduction of unemployment. This paper is a good illustration of the pitfalls of the Berman approach.

[39] J. C. R. Dow and L. A. Dicks-Mireaux, "The Excess Demand for Labour: A Study of Conditions in Great Britain, 1946-56," **Oxford Economic Papers,** New Series, Vol. 10, No. 1, Feb. 1958, pp. 1-33.

[40] *Ibid.*, p. 21. The pressure of labour demand d^* is measured as follows:

$$d^* = -u + \sqrt{uv} \text{ where } u > v$$

$$d^* = v - \sqrt{uv} \text{ where } u < v$$

See *ibid.*, p. 22. The asterisk has been used to distinguish this measure of labour demand from the one employed in Chapter III.

[41] *Ibid.*, p. 20.

[42] *Loc. cit.*

[43] Dow and Dicks-Mireaux assume that the unemployment-vacancies function is a rectangular hyperbola, so that

$$m = \sqrt{uv}.$$

This makes it possible to measure maladjustment m at any level of demand. See *ibid.*, p. 22.

[44] U.S. Joint Economic Committee, *op. cit.*; Walter W. Heller, "The Administration's Fiscal Policy," **Unemployment and the American Economy,** New York, John Wiley & Sons, (1964), p. 97; R. A. Gordon, "Has Structural Unemployment Worsened?" **Industrial Relations: A Journal of Economy and Society,** Institute of Industrial Relations, University of California, Vol. 3, No. 3, May 1964, pp. 61-7.

[45] U.S. Joint Economic Committee, *op. cit.;* Heller, *op. cit.;* R. A. Gordon, **Industrial Relations,** May 1964, pp. 61-7; Denton and Ostry, *op. cit.*, p. 13.

[46] Killingsworth, *op. cit.*, pp. 1471-77.

[47] N. J. Simler, "Long-Term Unemployment, the Structural Hypothesis, and Public Policy," **American Economic Review,** Vol. 54, No. 6, Dec. 1964, pp. 900-1.

[48] Otto Eckstein, "Aggregate Demand and the Current Unemployment Problem," **Unemployment and the American Economy,** John Wiley & Sons, New York, (1964), p. 119; Denton and Ostry, *op. cit.*, p. 13.

[49] Gallaway, *op. cit.*, pp. 710-2. The dispersion approach used in Denton and Ostry, *op. cit.*, pp. 9-12, and the U.S. Joint Economic Committee, *op. cit.*, pp. 20-1, falls somewhere between these two approaches insofar as it does not require the specification of the structurally disadvantaged groups, but contains the assumption that an increase in structural unemployment leads to a dispersion of the unemployment rates in the various labour force groups which is greater than that warranted by the prevailing overall unemployment rate.

[50] Oi, *op. cit.*, pp. 539-43.

[51] Reder, *op. cit.*, p. 319.

[52] Lipsey, **Employment Policy and the Labor Market,** pp. 249-252.

[53] This latter interpretation applies to Simler's approach. See Simler, *op. cit.*, p. 998. It is not clear which interpretation applies to the Denton-Ostry approach. In their definition they described structural unemployment to be of long duration. Subsequently, however, all that they asserted was that, according to the structuralist view, "workers who have been displaced by structural change will experience greater-than-average difficulty in shifting into new employment, and hence experience a *longer-than-average* period of job-seeking. . . . thus, one symptom of growing structural unemployment should be an *increase in the average duration* of unemployment." (See Denton and Ostry, *op. cit.*, pp. 15-6. Italics added.) All that this means is that a greater proportion of the structurally unemployed will be long-duration unemployed than of the demand-deficiency unemployed. It does not mean that all structural unemployment is long-duration unemployment.

[54] Berman, *op. cit.*, p. 263.

[55] *Ibid.*, p. 268.

[56] Simler, *op. cit.*, p. 997. An additional reason for the reduced probability of re-employment for the long-duration unemployed might be a decline in *morale*.

[57] *Ibid.*, p. 998.

[58] *Loc. cit.*

[59] *Loc. cit.*

[60] Berman, *op. cit.*, p. 256.

[61] *Ibid.*, pp. 256-7. It is not clear whether seasonal unemployment is to be broken down into the given components or whether it is to be regarded as a separate component. The omission of seasonal unemployment suggests that Berman had the first alternative in mind.

[62] *Ibid.*, pp. 259-60.

[63] *Ibid.*, pp. 256-7.

[64] Lipsey, **Employment Policy and the Labor Market,** pp. 210-6.

[65] *Ibid.*, pp. 211-2.

[66] *Ibid.*, p. 215.

[67] R. C. Wilcock and W. H. Franke, **Unwanted Workers,** Collier-Macmillan, London, 1963, p. 6. L. G. Reynolds has also defined frictional unemployment in this way. See Reynolds, **Labor Economics and Labor Relations,** Prentice-Hall, 1964, pp. 346-7. This approach inevitably makes structural unemployment a sub-type of frictional unemployment.

[68] Lipsey, **Employment Policy and the Labor Market,** p. 215. Italics removed.

[69] A. W. Phillips, **"The Relation Between Unemployment and the Rate of Change of Money Wages in the United Kingdom, 1861-1957,"** *Economica,* New Series, Vol. 25, No. 99, Nov. 1958, pp. 283-99.

[70] *Ibid.*, p. 283. Subsequently Lipsey developed a more rigorously formulated framework for the relationship, providing a justification for the shape of the function. ("The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1862-1957. A Further Analysis," *Economica,* Feb. 1960, pp. 12-19). This justification was attacked by Bernard Corry and David Laidler ("The Phillips Relation: A Theoretical Explanation," *Economica,* May 1967, pp. 189-

197) who argued that it was possible to have a positive relation between unemployment and wage changes in the excess-demand phase of the cycle. John Vanderkamp ("The Phillips Relation: A Theoretical Explanation — A Comment," *Economica*, May 1968, pp. 179-183) defended the postulated shape of the Phillips curve by strengthening Lipsey's framework. The Corry-Laidler rebuttal ("The Phillips Relation: A Theoretical Explanation — A Reply," *Economica*, May 1968, p. 184) promised a paper in which they hoped to show "that the Phillips relationship would be weaker where $V > U$ [i.e., where vacancies exceed unemployment]" but did not present a convincing defense of the possibility of part of the curve having a positive slope.

[71] Phillips, *op. cit.*, p. 283.

[72] Lipsey, *Economica*, Feb. 1960, pp. 20-23.

[73] S. F. Kaliski, "The Relationship Between Unemployment and the Rate of Change of Money Wages in Canada," **International Economic Review,** Vol. 5, No. 1, Jan. 1964, pp. 4-5.

[74] Lipsey, **Employment Policy and Labor Market,** p. 217.

[75] Berman, *op. cit.*, p. 260.

[76] Proulx, **Structural Unemployment and Public Policy,** Draft of a paper read to the Canadian Economics and Political Science Association Conference, Vancouver, June 10, 1965, mimeographed, p. 29.

[77] *Ibid.*, p. 26.

[78] *Ibid.*, p. 30.

[79] Ronald G. Bodkin, "An Analysis of the Trade-offs Between Full Employment, Price Stability and Other Economic Goals," **Canadian Economic Policy Since The War,** a series of six public lectures in commemoration of the twentieth anniversary of the "White Paper" on Employment and Income of 1945 delivered at Carleton University September-November 1965, Canadian Trade Committee, Private Planning Association of Canada, 1966, pp. 47-78.

[80] *Ibid.*, p. 73. Grant L. Reuber, on the other hand, undertook an empirical analysis which led him to the conclusion that "neither changes in the price level nor changes in the unemployment percentage . . . are significantly related to productivity changes." ("The Objectives of Canadian Monetary Policy, 1949-61: Empirical 'Trade-offs' and the Reaction Function of the Authorities," **Journal of Political Economy,** Vol. 72, No. 2, April 1964, pp. 113-115.) It should be noted, however, that this conclusion is based on multiple regression analyses of the relationships of the logarithmic values of the output per man-hour to (i) the inverse of the unemployment rate, time and *the deviation of the index of manufacturing production from its logarithmic trend* and to (ii) the same variables except unemployment which was replaced by inflation. On the basis of this formulation of the hypothesis, one should perhaps expect the statistical result that was obtained even if there is a relationship between the level of aggregate demand (as indicated by the unemployment and inflation rates) and the rate of economic growth. The cyclical indicator based on the manufacturing production index is likely to pre-empt any relationship of productivity growth to unemployment and inflation because not only is it likely to be correlated to unemployment and inflation but because it is a cyclical indicator that has probably less of a lag than the other two variables.

[81] Other reasons are also mentioned by Bodkin, but they essentially relate to a situation of demand fluctuations rather than a steady level of demand. See Bodkin, "Analysis of the Trade-offs," **Canadian Economic Policy Since The War,** pp. 52-54, 58.

[82] R. A. Gordon, "Full Employment as a Policy Goal," **Employment Policy and the Labor Market,** ed. A. M. Ross, University of California Press, 1965, pp. 30-4.

[83] John Vanderkamp has tested the effect of import prices on inflation and has found them to be very significant. See his "Wage and Price Level Determination: An Empirical Model for Canada," *Economica*, May 1966, pp. 203-210, and his "An Application of Lipsey's Concept of Structural Unemployment," **Review of Economic Studies,** July 1966, pp. 222-223.

CHAPTER III

A THEORETICAL MODEL OF STRUCTURAL DISEQUILIBRIUM FOR THE MEASUREMENT OF STRUCTURAL UNEMPLOYMENT

The previous chapter contains three approaches to the absolute measure of structural unemployment: (1) Berman's bottleneck model, (2) the unemployment-vacancy model by Dow and Dicks-Mireaux, and (3) Lipsey's trade-off model. Each model has its merits, but also suffers from certain weaknesses. Berman's model requires that labour bottlenecks be distinctly recognizable and, furthermore, it contains the highly unrealistic assumption that unemployment cannot be reduced any further once such a bottleneck has been encountered, except by selective manpower policies. The model by Dow and Dicks-Mireaux lacks a rationale about the labour market mechanism underlying it. Lipsey's trade-off model contains the impurities involved in the relationship of price inflation to labour demand.

In this chapter a model will be constructed which uses as pure a concept of structural imbalance as possible, and which is derived from an analysis of the underlying economic processes. To do this, structural unemployment will first be formally defined, initially in terms of the mismatching of labour characteristics, and subsequently in terms of structural disequilibrium. Then the concept of structural equilibrium and disequilibrium will be explained within the unemployment-vacancy framework of the model by Dow and Dicks-Mireaux, which is very useful for this purpose. Finally, the effect of fluctuations in overall demand will be analysed. This leads to an

equation the quantification of which will permit the measurement of structural unemployment.

1. Conceptual Definitions

a. Structural unemployment

The best definition of the concept, as distinct from the measure, of structural unemployment is in terms of the maladjustment approach. Accordingly, structural unemployment is defined as that component of unemployment which is due to a mismatching of the structure of demand for labour with the structure of supply of labour. In other words, the distribution of labour *qualities*, or characteristics, demanded by employers is different from the actual distribution of characteristics within the labour force; at the same time, the *quantity* of aggregate labour demand may or may not equal that of labour supply. This means that, on the one hand, there is a certain amount of unsatisfied demand for labour with certain characteristics, and, on the other, available labour with certain other characteristics cannot be fully used and is in excess supply. The term "structural imbalance" describes such situations well.

Examples of structural imbalance would be unemployment among coal miners accompanied by a shortage of mining engineers; a surplus of farm labourers and, at the same time, a dearth of construction labourers; unemployment among truck drivers in Halifax and abnormal over-time by truck drivers in Toronto. These examples show that the imbalance may occur in different dimensions, such as the occupational, the industrial and the regional. Generally, it is not just one of these dimensions which we might expect to be involved, but several of them simultaneously. So we might find that there is unemployment among coal miners in Nova Scotia and a shortage of inspectors in the electronics industry in Ontario. This, too, would be a case of structural imbalance and structural unemployment.

To the extent that unemployment is structural, it must have a quantitatively equivalent counterpart of labour shortage in some other group of the labour force. In other words, only that part of unemployment which is matched by an equal amount of vacancies can be called structural unemployment.

b. Demand-deficiency unemployment

The other component of unemployment is demand-deficiency

unemployment. Structural and demand-deficiency unemployment are here regarded as mutually exclusive as well as exhaustive. Any other type of unemployment must be regarded either as being a sub-group of one of these main types of unemployment or as being included in both of them in this system.

The definition of demand-deficiency unemployment follows from the definition of structural unemployment. Demand-deficiency unemployment is defined as that part of unemployment which is due to an inadequacy in the level of overall demand. In other words, it is the difference between the number of available jobs, filled and unfilled, and the number of workers in the labour force. According to this definition, there is no demand-deficiency unemployment as long as vacancies exceed unemployment. The difference between unemployment and vacancies, if positive, is the level of demand-deficiency unemployment.

c. Frictional unemployment

The two other types of unemployment which are conventionally referred to are frictional and seasonal unemployment. According to the structural imbalance approach, the distinction between structural and frictional unemployment is not very important. A distinction might be made on the basis of the duration of unemployment or of its susceptibility to structuralist policies. To avoid unnecessary complications, the definition of structural unemployment used here includes both short-duration unemployment as well as unemployment of intermediate or long duration. It includes employables, those who can be appropriately retrained, as well as unemployables, those who cannot be retrained for available jobs. For policy purposes, these distinctions may be important. For the purpose of measuring non-demand-deficiency unemployment, however, the combined treatment of frictional and structural unemployment is more convenient. Consequently, the term structural unemployment in this chapter will actually refer to frictional-structural unemployment.

d. Seasonal unemployment

Seasonal unemployment can in the context of this analysis be regarded as part of either demand-deficiency unemployment or of structural unemployment. It is attributable to demand deficiency to the extent that it results from seasonal fluctuations in overall demand

for goods and services and from seasonal fluctuations in the average non-labour costs (or the feasibility) of production and of the rendering of services, since they affect the level of overall labour demand.

Seasonal unemployment may be structural if during certain months of the year there are unfilled vacancies for certain groups of the labour force while there is unemployment among other groups. For example, winter unemployment among loggers may be accompanied by unfilled job vacancies among winter resort personnel. Part of the winter unemployment would then be structural. It could be eliminated if loggers could perform the winter jobs for which there is insufficient labour supply.

Seasonal unemployment may also be structural if there are year-round jobs which are open and unfilled, while there is seasonal unemployment. For the purpose of illustration, let us suppose that there are unfilled vacancies for mechanics who work the full year. At the same time there are seasonally employed loggers. Let the vacancies for mechanics be equal to the number of employed loggers, say x. During most of the year, there will be no unemployment in these groups, while vacancies will amount to x. In the winter, there will be x unemployed loggers and x vacancies for mechanics. Now, if the loggers were retrained to become mechanics, there would be x vacancies (for loggers) for only part of the year, and there would be no unemployment at any time of the year. Thus, according to our definition, seasonal unemployment in such a context would be structural.[1]

2. Refinement of the Measure of Structural Unemployment

The above definition of structural unemployment is easily quantifiable, given appropriate vacancy data.[2] The structural unemployment rate, as defined so far, is simply the unemployment rate or the vacancy rate, whichever is less at any point of time. This definition would make it possible to measure the structural unemployment rate without difficulty. It has, however, a complicating idiosyncrasy: this measure is liable to cyclical fluctuations.

This can best be seen by referring to Figure 2.2(a) in the previous chapter, which represents the relationship between the unemployment and vacancy rates hypothesized by Dow and Dicks-Mireaux. The upper part of the function F_1F_1' represents conditions of demand deficiency where the vacancy rate is smaller than the unemployment

rate and therefore equal to the structural unemployment rate according to the above definition. As we move from F_1 toward F_1', the vacancy rate and the "structural unemployment rate" increase until we reach the diagonal. At this point we enter conditions of excess demand, where the unemployment rate is smaller than the vacancy rate and therefore represents the "structural unemployment rate." As we move toward F_1' the total and "structural" unemployment rates decline.

It does not make sense, however, to have a cyclically fluctuating structural unemployment rate. Consequently, the definition of structural unemployment must be restricted to apply only to the point of full-employment demand when the unemployment and vacancy rates are equal:

$$u_s = u = v \text{ when } u = v \tag{3.1}$$

Now nothing can be said about the level of structural unemployment when there is deficient or excess labour demand, until the cyclical relationship between the unemployment and vacancy rates is determined. This is the purpose of the remainder of this chapter. Before this relationship is discussed however, the next section analyzes the concept of a vacancy.

3. The Relevant Definition of a Job Vacancy

It is important for this analysis that vacancies be appropriately defined. Since the structural vacancy rate must be equal to the structural unemployment rate in this model, there must be a certain conceptual symmetry between vacancies and unemployment. Just as unemployment represents potential additional employment on the supply side, so vacancies must represent potential additional employment on the demand side.

Basically a vacancy is an unfilled job opening. This concept, however, involves ambiguities with respect to (1) the efforts of the employer to fill the vacancy, (2) the time at which a job applicant could be employed, (3) the wage conditions, (4) the demand for labour which is complementary to the vacancy, and (5) the distinction between potential job additions and potential job substitutions.

Since a vacancy represents potential employment and not necessarily a dire scarcity, there is no need to impose the restrictive condition that the employer must be actively searching for a worker to fill the vacancy. It is only necessary that if a job applicant with the

appropriate qualifications presents himself, he will be hired.

There must be the condition, however, that he will be hired right away (except where labour complementarities are involved, as will be seen below) if the vacancy is to be part of the current unsatisfied labour demand.

Connected with this point is the problem of inflated vacancies due to the bidding of several firms for the same contracts. The jobs created by planning for the projects will be greater than those finally available because they will disappear in the unsuccessful firms. The permanency of a job, however, is not a necessary criterion in the definition of a vacancy. As long as employers are prepared to hoard labour for the expected contracts and hire before their awarding, these jobs must be regarded as vacancies.[3] The fact that the unsuccessful employers may lay off the newly hired persons, or drop the vacancy soon afterwards, merely means that there is a certain volatility in labour demand at the disaggregated level. At the aggregate level this effect is not likely to be noticeable.

The third problem is whether or not to exclude job openings with sub-standard wages from the measure of vacancies. The "standard" wage may refer to either a legal minimum, a non-legal minimum determined on the basis of some social criterion, or the market equilibrium level.

In the case of a legal minimum, the exclusion of job openings offering wages less than this standard will depend on whether it is comprehensively enforcible, whether illegally filled jobs are excluded from the employment figure, and whether the employment prevented by the legal barrier is not to be included in the measure of structural unemployment. The application of a social minimum to the definition of a vacancy requires that jobs filled at sub-standard wages be excluded from the employment and labour force figures.

The application of a standard based on the market equilibrium wage is more complex. If a standard wage requirement were to be used to represent the equilibrium wage in the present this would exclude all vacancies because the very existence of a vacancy indicates that the wage rate is below the short-run equilibrium level. Instead, one would have to use some concept of a "normal" wage which would bring about equilibrium after a reasonable period of time has been allowed for structural adjustment.

This problem has its counterpart in the definition of unemploy-

ment. The Report of the Committee on Unemployment Statistics stated:

> "Some housewives and retired men are available for work but prepared to accept work only under specific circumstances of pay and surroundings; others are eager to obtain immediate work of almost any kind. The latter are obviously unemployed; but whether the former should be classed as unemployed depends on the intensity of their desire for work and on whether the specific circumstances they have in mind are reasonably commensurate with their qualifications."[4]

Once it has been determined that the unemployed are best enumerated by using the discretionary criterion of "whether the specific circumstances they have in mind are reasonably commensurate with their qualifications," rather than letting the employment status be determined by the interviewee, the enumeration of vacancies must be conducted on a parallel basis. Thus, job openings must be counted as vacancies as long as they provide benefits and conditions "commensurate" with the type of work and qualifications required.[5]

Alternatively, if unemployment is defined to include persons with wage demands so high, and vacancies to include job openings with wage offers so low, as to prevent the elimination of structural unemployment, even when the demand and supply structures with respect to all other characteristics have been perfectly matched, then this means that the remaining structural imbalance is due to a mismatching of the wage characteristics of demand and supply.[6] What is important for the measurement of structural unemployment is not so much the scope of the concepts of unemployment and vacancies but their symmetry with respect to each other, so that job seekers and job openings are comparable.

The fourth problem in defining vacancies stems from the danger of omitting vacancies which could be filled with available labour but are not because certain complementary labour is not available. If the employment of a shift of workers is held up because of the unavailability of a shift engineer, then not only must the job of shift engineer be regarded as a vacancy but also the jobs of the whole shift, since these represent the current potential employment. Thus any survey of job vacancies whose data is to be used in labour demand estimates, must ask not only for the job openings that cannot be filled

but also for the additional labour that would be hired if the difficult vacancies were filled.

Such complementarities may exist not only within establishments but also between them. Inter-establishment complementarities may manifest themselves in bottlenecks in the inter-industry product flows for which labour bottlenecks are responsible. Thus the expansion of employment in the automobile industry may be halted in spite of brisk consumer demand, because there is a labour bottleneck in the steel industry supplying the auto industry. Such a complementarity can exist on the input side as well as on the output side of the firm or industry in which the labour bottleneck exists. We can have, therefore, the converse case where a labour bottleneck in the auto industry impedes the expansion of employment in the steel industry in spite of growing final demand. Unless the difficulties involved in tracing these complementarities can be overcome, there will be deficiencies in the quantification of the vacancy rate and relative labour demand and the creation of a statistical demand effect associated with structural adjustment.[7]

This also raises the problem of structural imbalances in the system created by bottlenecks in the supply of production inputs other than labour. It might be argued that since these bottlenecks cannot be cleared up by manpower policies, the unemployment they cause must be attributed to a shortage of *labour demand* which *then* is to be traced to a structural imbalance rather than overall demand deficiency. Unless we want to abandon the dichotomy between aggregate-demand and structuralist policies, however, and create the additional distinction between structuralist manpower policies and other structuralist policies, it makes more sense to classify unemployment attributable to non-labour structural imbalances as structural unemployment, too.

This is also justified by the fact that there may be a choice as to the policy by which to reduce a structural imbalance; that is, by changing the structure of supply either of labour or of raw materials and intermediate products, or of capital and technology. For example, a shortage of plasterers and lathers might be met either by encouraging more workers to enter the occupation, or by stimulating the production and use of more semi-fabricated building materials, or by inducing the use of more labour-saving equipment. Similarly, a shortage of bookkeepers might be reduced either by paying training

allowances for accountant courses, or by making information available on alternative accounting systems which require fewer accountants. The availability of these options may sometimes make it difficult, as well as pointless, to determine the particular production input "responsible" for the structural imbalance.[8] Thus, ideally, jobs which would become available if a production input bottleneck of any kind was eliminated should also be considered vacancies.

On the basis of these problems, it may be worthwhile to distinguish between two types of vacancy: (1) overt vacancies, and (2) latent vacancies. Overt vacancies are those which can be filled immediately because they involve jobs for which the required complementary production inputs are available. Latent vacancies are those which appear only when the currently unavailable complementary inputs become available.

From the point of view of policy this distinction is important. For manpower policy it is much more important to tackle the overt vacancies, since by filling them it will increase employment not only by the number of overt vacancies, but also by the number of job seekers available for complementary latent vacancies.

Taking into account the problem of actual data collecting, it may not be possible to enumerate more than the overt vacancies. Perhaps the latent vacancies associated with the overt vacancies in the same establishments can be obtained by surveys. But if it is thought that the latent vacancies resulting from bottlenecks in complementary firms are significant, they have to be estimated.[9]

The fifth problem in defining vacancies arises when the act of vacancy-filling would merely lead to the displacement of currently employed persons. If a company declares a job opening for a well-educated salesman who could replace one of their present salesmen — one who has had little schooling — this vacancy does not represent a potential increase in employment. Thus we have to distinguish job offers which are potential job additions from those which are potential job substitutions and exclude the latter from our vacancy measure.

The appropriate definition of a vacancy can be reduced to a job opening which could be filled immediately if (a) the appropriate job applicant presented himself or (b) the required complementary production inputs were available, and whose filling would not involve the dismissal of a presently employed worker.

4. The Model

a. Purpose and outline of the model

Since the models discussed in Chapter II have various distinctive weaknesses, it is necessary to develop a model which can satisfactorily explain the relationship between the structural unemployment rate and the relative labour demand, and provide an equation that will yield a formula by which the unemployment rate at any level of labour demand can be adjusted to the corresponding rate at the level of full-employment demand. This is the aim of the model which follows.

Since structural unemployment represents a failure or a sluggishness of the equilibrating mechanism of the labour market, the model will be based on the interaction of structurally disequilibrating and equilibrating effects which are exerted on and by the labour market. Consequently, the concept of structural equilibrium and disequilibrium will first be analyzed. Then the basic part of the model will be developed, where it will be assumed that there is continuous full-employment demand. This assumption is finally dropped and the implications of varying demand are investigated. In the end a model is obtained which, when applied to data, will provide a formula for the measurement of structural unemployment.

b. The concept of structural equilibrium and disequilibrium

Structural equilibrium in the labour market is achieved when the structure of labour demand is matched by the structure of labour supply. This means that when the relative labour demand, that is, the per cent of aggregate labour demand relative to aggregate labour supply, is 100, there is neither unemployment nor vacancies. Furthermore, it means that when there is excess demand, the vacancy rate is equal to the excess relative labour demand, while unemployment is zero. Conversely, when there is demand-deficiency, the unemployment rate is equal to the deficiency in relative labour demand, with the vacancy rate equal to zero.

If there is unemployment as well as vacancies, however, this means that the forces of substitution outlined in the previous chapter have not yet been able to convert the characteristics of all the structurally unemployed into characteristics appropriate for the vacancies, or to convert all structural vacancies so that they will fit the charac-

teristics of the unemployed. The labour market is, consequently, in disequilibrium in the structural sense.

Structural disequilibrium is caused by structural dislocations of the labour market, the adjustment of which is impeded by limited or lagging substitutability among different types of labour and other production inputs. A disequilibrating effect involves the conversion of employment into unemployment and vacancies. If a structural change creates a vacancy which cannot be filled immediately and at the same time makes a worker superfluous, it has increased the structural disequilibrium by one worker. The simultaneous creation of vacancies and unemployment may not be due to any single structural change nor may it occur within a single firm, but emerge from the whole concurrent set of structural changes and be dispersed over the whole economy. Disequilibrating effects would be exerted by an array of structural changes which displace workers in certain occupations, industries, areas, etc., and provide potential employment in others.

They are counteracted by the equilibrating effects of structural adjustment. Structural adjustment can occur through three forms of substitution:

(1) Consumers may switch from those products that have scarce labour embodied in them, and the prices of which are therefore rising, to goods that are produced by more abundant types of labour, and characterized by prices rising less than the general level or even, in some instances, falling.

(2) Producers may adopt new production techniques which economize on scarce types of labour and perhaps utilize more extensively the abundant types of labour. They can also reduce those non-labour production inputs whose supply is adversely affected by the labour bottleneck, and increase those which are substitutable for the scarce inputs, whether labour or other.

(3) The characteristics of jobs and workers may be substituted. Employers may sacrifice quality and efficiency and fill their vacancies with inferior labour, or, alternatively, upgrade labour by providing training. Workers may accept employment in other firms, industries and areas and retrain so as to enter new occupations in order to escape unemployment or to increase their earnings. New workers with more appropriate qualifications may replace retiring workers with obsolete skills. Thus, structural adjustment can occur through

equilibrating changes in the structure of labour demand (consumer substitution, equilibrating technological change, changes in non-labour production inputs, modification of job requirements) as well as in the structure of labour supply (labour mobility, education and training).

Structural adjustment is equilibrating in the sense that it converts unemployment and vacancies into employment. If an unemployed worker moves from Vancouver to Toronto to fill a job opening there, he is substituting his geographic characteristic of being a resident of Vancouver by that of being a resident of Toronto, thereby reducing unemployment in Vancouver and vacancies in Toronto and increasing overall employment. The structural disequilibrium, measured by structural unemployment or structural vacancies, has thus been reduced by one worker.

c. Changing overall demand

Until now relative labour demand has been assumed to remain constant. If the model is to be applied to a cyclically fluctuating economy, this assumption must be relaxed.

Let us look at the following hypothetical sequence of events:

(1) The initial position is one of such low demand that there is only a negligible vacancy rate or none at all.

(2) A sudden structural shock takes place during this depression.

(3) There are no additional structural changes during the subsequent phases of the cycle, nor does any structural adjustment take place. In other words, there is absolute complementarity on the labour demand side and non-substitutability on the labour supply side.

In this case, as long as aggregate demand is very low, the structural shock will not be manifested by vacancies. It is only when demand rises to an adequate level that a bottleneck will occur, and unemployment will not decline with subsequent increases in demand that will be fully represented by increases in vacancies. The employment growth is ended once the bottleneck is encountered. This pattern occurs in reverse during the contraction. When demand falls below the point where the structural imbalance is no longer a bottleneck, the burden of demand decline shifts from vacancy decline to unemployment increase. This case describes the Berman model of

the problem of structural imbalance. Its striking characteristic is that demand changes exert themselves either on unemployment or on vacancies (depending on the phase of the cycle), but not on both simultaneously.

To come closer to reality, the assumption of complete complementarity has to be replaced by that of partial complementarity. It is not realistic to assume that the very first labour bottleneck completely inhibits any further employment expansion, even if it is assumed that there is no structural adjustment. Expansion can still continue in those firms which have not run into labour bottlenecks and which do not depend on orders or supplies from firms which actually have encountered such bottlenecks. For example, a shortage of skills in the rubber goods industry may inhibit the expansion of the automobile industry which requires tires, but will not affect the food processing industry. This is what is meant by partial complementarity. As demand increases, the overt vacancies in the rubber goods industry and the latent vacancies in the automobile industry will increase, but other industries will be able to expand employment.

As the labour bottlenecks increase with demand, the vacancies will rise at an accelerating rate. This is so because with rising demand (1) the vacancies associated with each bottleneck will increase, and (2) the number of bottlenecks itself will increase. Conversely, unemployment will decline at a decelerating rate, as (1) unemployment in each labour group is diminished, and (2) the number of labour groups characterized by unemployment is reduced.

This can be demonstrated by the following simple example. Let us assume that our economy consists of three industries which are sufficiently independent of each other in the inter-industry flow pattern that the continued expansion of each does not depend on the continued expansion of the other two. We are also maintaining the assumption that there are no structural adjustments and no additional structural dislocations. Thus, there will be no mobility of labour, neither of the employed nor of the unemployed, from one industry to another.

We can now plot hypothetical labour demand functions for the three industries, A, B and C, with respect to overall labour demand (D); demand being measured in terms of numbers of workers (N). (See Figure 3.1.) The supply of labour (S) for each industry is constant since we are assuming no structural adjustment. Unemploy-

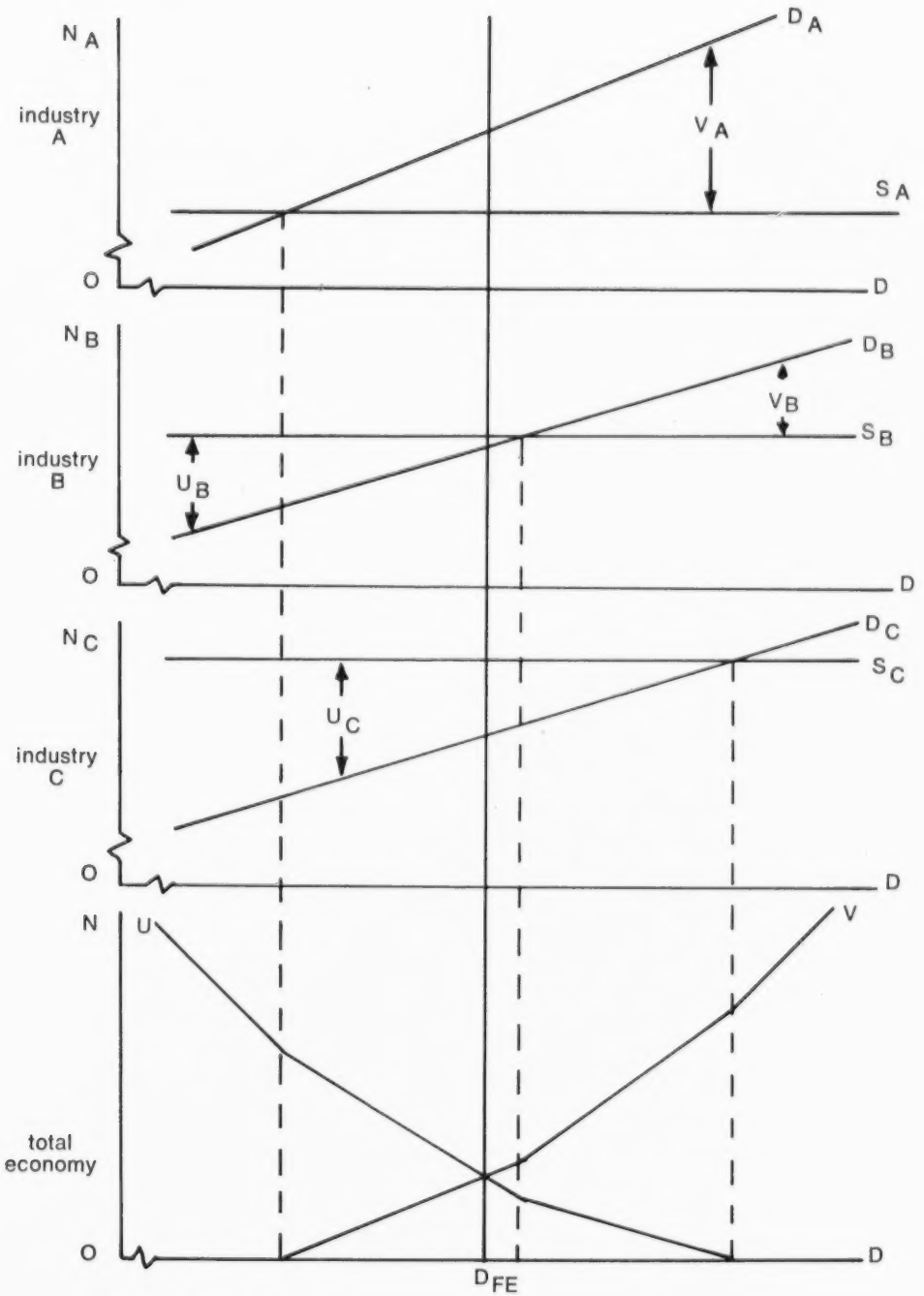

FIGURE 3.1
An illustration of the effects of accumulating labour bottlenecks in different industries on the relationship between overall labour demand (D), on the one hand, and unemployment (U) and vacancies (V), respectively, on the other

ment is represented by the excess of supply over demand and vacancies by the excess of demand over supply. The first labour bottleneck in the expansion of overall demand is encountered in industry A, leading to the emergence of the first vacancies. As overall demand continues to increase, the vacancies in A will also increase. Then a bottleneck appears in industry B, which means that the rate of increase of vacancies per unit of overall demand will rise from the rate of increase of demand in A per unit of overall demand to the sum of the rates of increase of demand in A and B per unit of overall demand. When the bottleneck in C is reached, the rise in vacancies is again accelerated. After all the industries have encountered bottlenecks, the acceleration will come to an end and the slope of the vacancy function will be one. This must be so since unemployment among those currently employable without structural adjustment has been eliminated so that, according to our definition of labour demand, the total demand for labour will rise by one labour unit with each additional vacancy.

Similarly, unemployment falls at the same rate as that at which labour demand rises, until the first unemployment pool is exhausted, that is, the first labour bottleneck appears in the form of vacancies. Any further expansion of labour demand will be accompanied by a diminishing rate of reduction of unemployment, until the unemployment pools of all currently employable labour groups have been absorbed.

This basic shape of the unemployment and vacancy functions is not changed by relaxing the assumptions about structural dislocations and adjustment. So far it has been assumed that after the initial structural imbalance no further dislocations occurred and no structural adjustment took place. The effect of continuous adjustment and dislocations on the functions will now be considered. The effect of structural adjustment is to accentuate the curvature of the unemployment and vacancy functions. Structural adjustment has been shown above to occur on the labour demand side through consumer substitution and technological change, and on the supply side through industrial, geographic and occupational mobility. If final demand and production techniques are responsive to labour shortages, labour demand will shift from unit A, in the example, to unit C and perhaps to B as overall demand increases. This means that vacancies in A will increase less rapidly and unemployment in B and C will decline

more rapidly than is indicated in Figure 3.1.

A more responsive form of adjustment, however, is probably labour mobility. As vacancies emerge in A, the unemployed in B and C are likely to try to get jobs in A. The less adjustment in the form of geographic movement and changes in occupation is required, the more significant will be this shift. Its effect is to reduce the labour supply of C and increase that of A, which again means that the increase of vacancies in A will be moderated and the decline in unemployment in C will be accelerated. The result is that the vacancy and unemployment functions intersect at a lower point, which means that structural unemployment is lower.

Continuous structural dislocations, however, will work in the opposite direction. Labour demand in the tight industry may be pushed up and in the slack industry down and even on the supply side there may be structural dislocations in the form of particularly high attrition in the tight industry (although that is an unlikely instance). This will push up the unemployment and vacancy functions and flatten their curvature.

The net result, in an economy with many industries and a large distribution of bottlenecks, will be the kind of continuous functions shown in Figure 3.2(a). When they are combined into a single function in the unemployment-vacancy coordinate system, they emerge as the hyperbola shown in part (b) of Figure 3.2. This is consistent with the function used by Dow and Dicks-Mireaux and the preceding discussion therefore provides a theoretical rationale for it too.

We now have the relationship

$$u = f(v)$$

which is of an approximately hyperbolic shape. It is not a single function, however, but a set of functions, all of which incorporate the same relationship between the unemployment rate and the vacancy rate but each of which corresponds to a different level of structural imbalance, i.e.

$$u_t = f(v_t, a_t) \tag{3.2}$$

where a varies with the level of structural imbalance.

The structural unemployment rate can then be obtained by solving

$$u = f(u, a_t) \tag{3.3}$$

for u. The latter then represents the structural unemployment rate.[10]

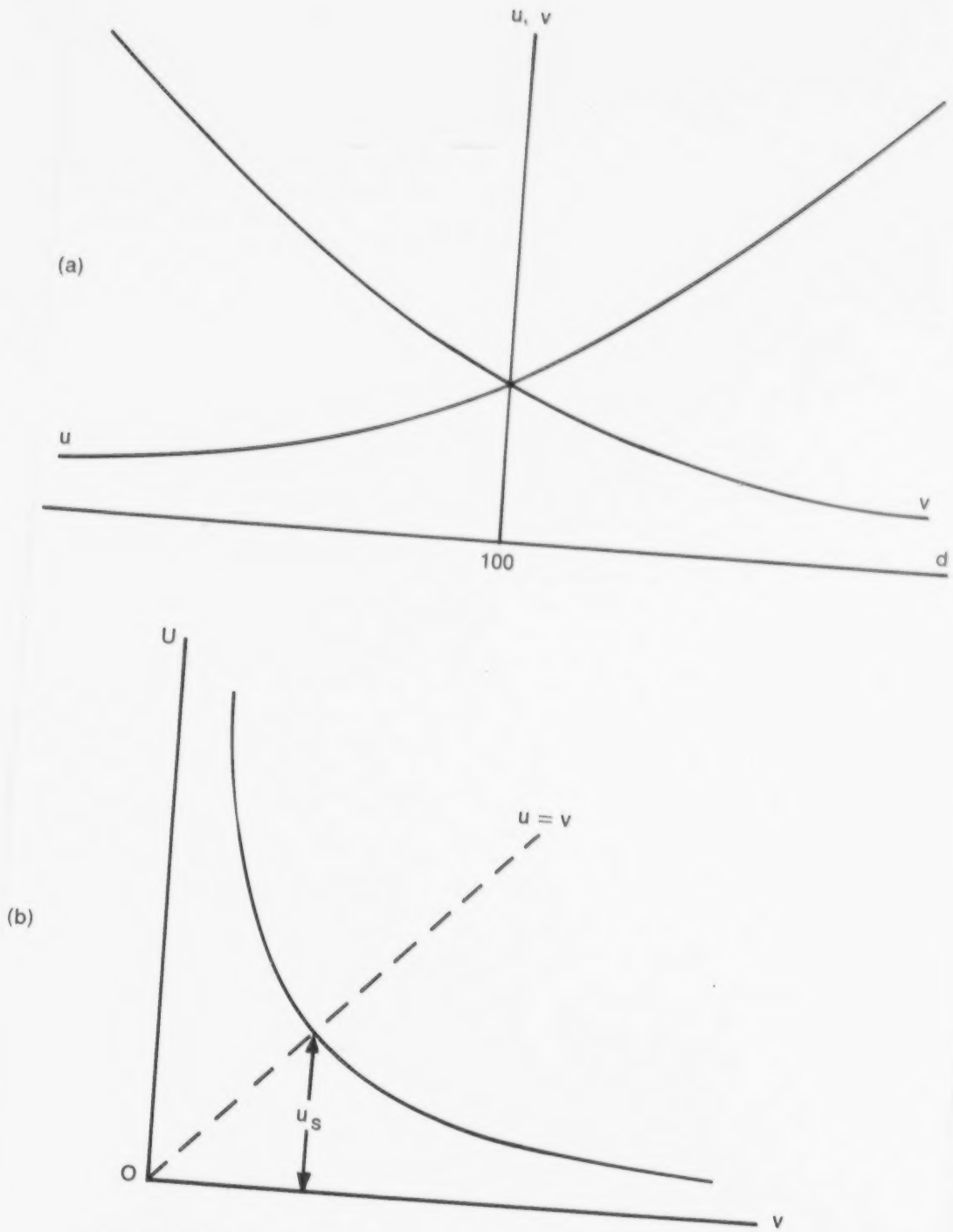

FIGURE 3.2
The cyclical relationship of the unemployment rate, u, and the vacancy rate, v, (a) to relative labour demand, d, and (b) to each other

5. Summary

The purpose of this chapter has been to construct a model for the absolute measurement of structural unemployment which (1) employs variables *directly* related to the labour market, (2) is based on a theoretical rationale, and (3) makes it possible to compare structural unemployment under various demand conditions.

The basic definition on which the model is based is that of structural unemployment; that is, that part of unemployment which is quantitatively matched by vacancies. It represents the qualitative imbalance between labour demand and supply. The measure which derives from this definition, however, fluctuates with the cycle in overall demand. The definition, therefore, had to be restricted to apply only to full-employment-demand conditions. Under other conditions certain adjustments have to be made.

To determine these adjustments, the cyclical relationship between unemployment and vacancies had to be analyzed. After considering the effect of bottlenecks on cyclical expansion and contraction and of structural adjustment and dislocations, it was concluded that the relationship is hyperbolic. Based on the fact that there is this definite relationship between unemployment and vacancies, the simple equations for the measurement of structural unemployment were developed.

FOOTNOTES TO CHAPTER III

[1] This example is an indication of the danger involved in minimizing unemployment without considering earnings. Seasonal work may well pay enough to make up for the idleness during part of the year. Nevertheless, training may be warranted to provide for seasonal labour mobility and thus maximize labour income as well as alleviate labour market shortages at least during the slack season.

[2] The fact that only inadequate vacancy data are available in Canada does not make this approach useless. It remains useful in that (1) a job vacancy survey is currently being developed by the Dominion Bureau of Statistics and the Department of Manpower and Immigration and adequate vacancy data should therefore be available in the future; and (2) it can still be used in the meantime for statistical testing (a) by making estimates of the vacancy rate on the basis of N.E.S. vacancy data or (b) by using a statistical proxy for the vacancy rate, such as the rate of change of wage rates. In Chapter IV N.E.S. vacancy data are used.

[3] See J. C. R. Dow and L. A. Dicks-Mireaux, "The Excess Demand for Labour: A Study of Conditions in Great Britain, 1946-56," **Oxford Economic Papers,** New Series, Vol. 10, No. 1, Feb. 1958, p. 16.n.2., for a similar position.

[4] Canada, Government, Departments of Trade and Commerce and of Labour, Committee on Unemployment Statistics, **Report,** Ottawa, 1960, pp. 4-5.

[5] The applicability of the intensity-of-desire-for-work criterion, on the other hand, depends on the purpose of the unemployment measure. If unemployment is to measure only unquestionably *involuntary* unemployment, then there are legitimate grounds for excluding unemployed persons merely prepared to accept work but not

actively seeking it, whereas if unemployment is to measure the *potential expansion of employment*, they must be included, because they represent potential matches for appropriate vacancies.

[6] The appropriate structuralist measure would be a program of information by which the job seekers and the employers are made aware of the incompetitiveness of their wage demands and offers, respectively.

[7] Conversely, the statistic for labour demand will be reduced as disequilibrating effects create more unemployment than recorded vacancies.

[8] In the determination of a shortage of non-labour production inputs, the same types of problem arise as in the definition of a job vacancy.

[9] Two basic methods of estimating the latent vacancies have occurred to me; one aggregative and the other disaggregative. The aggregative method involves the separation of changes of employment due to changes in aggregate demand from those due to changes in structural imbalances. Without going into details and problems of such an empirical analysis, it seems to me that this separation can be obtained on the basis of the observation that changes in aggregate demand result in changes in employment and vacancies in the *same* direction, whereas changes in the degree of structural maladjustment result in changes in employment and vacancies in *opposite* directions, since in the latter case either the employed are displaced while vacancies occur elsewhere, or the unemployed find matching vacancies and thus reduce vacancies while increasing employment.

The disaggregative method involves input-output analysis. Assuming that the intra-establishment effects can be directly surveyed, the remaining inter-industry effect of overt vacancies on employment can be assessed on the basis of the responsiveness of the relevant occupation-industry coefficients to the labour bottleneck. The more rigid these coefficients are, that is, the more the industry output is affected by its overt vacancies, and the more the dependent industries are affected by the restraint on output placed on the industry with the vacancies, the greater will be the employment effect. In other words, the degree of rigidity or responsiveness of the coefficients indicates the quantitative significance or insignificance respectively, of changes in latent vacancies.

[10] More specifically, as is mentioned on pages 69–73 and 77 below, equation (3.2) can be approximated by

$$u_t = \frac{d_t}{v_t} \text{ so that}$$

$$d_t = u_t v$$

and equation (3.3) becomes

$$u = \frac{d_t}{u}$$

so that

$$u = \sqrt{d_t} \text{ or}$$

$$u_{s_t} = \sqrt{u_t v_t}$$

where u_{s_t} is the rate of structural unemployment at time t.

CHAPTER IV

APPLICATION OF THE STRUCTURAL DISEQUILIBRIUM MODEL TO CANADIAN DATA

The structural disequilibrium model described in Chapter III was constructed primarily for the measurement of structural unemployment and its variations. To make it applicable, however, reliable vacancy statistics are required. Unfortunately, these are not at present available for Canada. Only vacancies reported to the National Employment Service are recorded, and they are not very reliable. They can be used, however, to demonstrate how the model is to be applied, and the period 1953-65 is covered for this purpose. It would be unwise to use them to definitively measure structural unemployment.

1. The Data Problems

a. The statement error in the reported vacancies

It is quite obvious from the description of the source that the number of vacancies reported to N.E.S. falls far short of the economy's total vacancies. While the estimate of the statement error is not necessary to test the theoretical relationships in the model, it is done, nevertheless, to get a reasonably approximate picture of overall labour shortages and surpluses for which a vacancy rate comparable in measurement to the unemployment rate is necessary, and to make the cardinal measure of structural unemployment realistic.

One approach to the estimate of the statement ratio is to use the ratio of the total hirings to those hirings which resulted from N.E.S.

referrals, as the statement ratio of the total vacancies to the unfilled vacancies reported to N.E.S. The use of the hirings ratio is based on the relationship between the vacancy rate, the hirings rate and the average duration of vacancies. As long as these three variables are relatively stable, the average duration of vacancies is equal to the vacancy rate divided by the hiring rate.

$$d^v = \frac{v}{h} \tag{4.1}$$

where d^v = average duration of vacancies,
and h = hiring rate.

For example, if the vacancy rate is stable at 8 per cent of the labour force and the hiring rate in the current month is 4 per cent, new vacancies must be appearing at a rate equal to the hiring rate; that is, 4 per cent of the labour force. Assuming, temporarily, that the duration is the same for all vacancies, half the vacancies will have appeared in the previous month. The other half must have appeared in the second-last month, and in the current month is being filled and replaced in the vacancy pool by the new vacancies. This means that the vacancy duration is two months (8 divided by 4). If we relax the assumption of equal vacancy durations, the conclusion has to be modified to refer to the *average* vacancy duration.

If there are significant fluctuations in any of the three variables, the above statement of the relationship is partially upset by lags contained in the actual relationship, which, to be completely accurate, would have to be described in terms of the emergence and filling rates of vacancies and the relative distribution of vacancy durations. In the context in which the relationship is used, however, this problem can be ignored, as will be seen below.

The above relationship can be restated as

$$v = hd^v \tag{4.2}$$

If T is used to denote vacancies in the whole economy and N vacancies handled by N.E.S., then the vacancy statement ratio is given by the equation

$$\frac{V_T}{V_N} = \frac{h_T d_T^v}{h_N d_N^v} \tag{4.3}$$

The problem with this formula is that there is no information about d_T^v. To solve it, it is assumed that

$$d_T^v = d_N^v \tag{4.4}$$

Is this assumption reasonable? Employers may, on the whole, have been passing on to N.E.S. only those vacancies which were relatively difficult to fill. On the one hand, N.E.S. had immediate contact with a very large labour supply. Furthermore, jobs for highly skilled labour, which probably have longer vacancy duration than semi-skilled and unskilled jobs, tended to be filled outside the N.E.S. system. On the basis of these considerations it is certainly not obvious whether the average duration of N.E.S. vacancies or that of all vacancies was greater. Equality between the two, on the other hand, is not obvious either.

The argument for continuing to use the assumption consists of the following points: (1) No better method was discovered. (2) Even if the assumption of equality is not correct, the results will still be meaningful as long as the ratio of d_T^v to d_T^v is more or less constant. That the ratio is approximately constant is reasonable to assume. That the results will still be meaningful in that case is due to the fact that the most important purpose of the exercise is to discover any trend in structural unemployment rather than its precise level. Thus, while there may be a bias in the vacancy rate and, therefore, in the structural unemployment rate, as long as this bias is constant the trend will be free from it.

With this assumption equation (4.3) becomes

$$\frac{V_T}{V_N} = \frac{h_T}{h_N}$$

or

$$V_T = \frac{h_T}{h_N} V_N \qquad (4.5)$$

Information about the hirings ratio has been obtained from two sources: the Survey of Hirings and Separations in Certain Industries, covering about two thirds of the employed labour force; and the N.E.S. statistics on placements. The data are provided in Table I.

Table I

Ratio of Total Hirings to N.E.S. Placements

	Average Monthly Hiring Rate %	Annual N.E.S. Placements '000	Monthly N.E.S. Placement Rate (% of labour force)	Total Hirings: N.E.S. Placements Ratio
1953	6.9	993	1.53	4.5
1954	6.5	862	1.31	5.0
1955	6.9	954	1.42	4.9
1956	7.4	1,047	1.51	4.9
1957	6.7	878	1.22	5.5
1958	6.0	840	1.14	5.3
1959	6.3	986	1.32	4.8
1960	6.0	958	1.25	4.8
1961	6.0	1,120	1.43	4.2
1962	6.2	1,336	1.68	3.7
1963	6.2	1,178	1.45	4.3
1964	6.4	1,241	1.49	4.3
1965	6.4	1,258	1.47	4.4
Average				4.7

Sources: (1) D.B.S., **Hiring and Separation Rates in Certain Industries,** Cat. No. 72-006.

(2) Canada Department of Labour, **Labour Gazette.**

The last column in this table also provides the vacancy statement ratio. It fluctuates to a certain extent, but on the whole it is reasonably stable around the average of 4.7. Rather than make any pretensions to great reliability by using the most refined method, which would be more sensitive to the crude assumptions underlying it, it is assumed that the vacancy statement ratio has been more or less stable around 4.7.

The vacancy rate computed on the basis of this method is given in Table II toward the end of this chapter.

b. The period of analysis

The period of analysis that has been chosen is 1953 to 1965.

1965 was selected because in that year there occurred administrative changes in Canada's employment service which destroyed the comparability of the vacancy series over time and which were the reason for their ultimate discontinuation. 1953 was used as the starting point because before that year the Labour Force Survey was not conducted monthly, but only four times a year. The period 1953 to 1965 appeared to provide an adequate number of observations, and is was, therefore, not considered worthwhile to construct a seasonally adjusted quarterly series for unemployment and the labour force from four observations a year for the years before 1953.[1]

2. Estimation of the Structural Unemployment Rate

a. Methodological considerations concerning the disturbance term

Chapter III concluded with the statements that equation (3.2)

$$u_t = f(v_t, a_t)$$

(where a is a measure of the level of structural imbalance) provides the relationship on the basis of which the structural and demand deficiency components of the unemployment rate can be isolated. If random disturbances are included, the equation becomes

$$u_t = f_1(v_t, a_t) + e_{1t} \tag{4.6}$$

where e_{1t} is the disturbance term.

However, a_t is not an available statistical series and is therefore an unknown. It must consequently be obtained by one of the following methods.

The first method is to assume that

$$e_1 = 0$$

that is, that all variability in the relationship between u and v is attributable to a.

The second method is to allow e_1 to vary by assuming a relationship of a to one or more available statistical series:

$$a = f_2(x_i) + e_2 \tag{4.7}$$

where the x_i's are the independent variables and e_2 is the disturbance term. Equation (4.6) now becomes

$$u = f_1[v, f_2(x_i) + e_2] + e_1 \tag{4.8}$$

Two problems arise here. One is that in order to estimate this function

by regression analysis, one has to assume that

$$e_2 = 0$$

or, in other words that a is not merely approximated by $f_2(x_t)$, but fully determined by it. The other problem is to find appropriate statistical series. One approach might be to use time as a proxy. But there is no good reason to presume that the level of structural imbalance follows a smooth time trend. Consequently, the assumption that $e_2 = 0$ would be quite inadmissible. Another approach is to see whether one can find good proxies for the rate of structural dislocation and the rate of structural adjustment, the difference between the two representing the net change in the level of structural imbalance. The attempt to find a satisfactory set of proxies was, however, unsuccessful.[2]

For these reasons it was decided to adopt the first method and use the assumption that $e_1 = 0$. There is really no great harm in that. An increase in the vacancy rate without a change in the unemployment rate, for example, suggests an increase in the structural imbalance level rather than a statistical error or other form of non-structural disturbance, which is less likely.

b. Alternative forms of the relationship between the unemployment rate and the vacancy rate

There are alternative forms into which equation (3.2)

$$u_t = f(v_t, a_t)$$

can be put. The following will be considered.

(i) *Estimation without regression analysis:* One method is to assume the simple hyperbolic relationship

$$u = \frac{a}{v} \tag{4.9}$$

where a can vary with uv. According to the definition of structural unemployment in Chapter III

$$u_s = u \text{ when } u = v$$

so that in this case $u_s = u$ when the two functions $u = \frac{a}{v}$ and $u = v$ intersect. This occurs when

$$u = \sqrt{a}$$

so that

$$u_{s_t} = \sqrt{u_t v_t} \tag{4.10}$$

The difficulty with this form is that it imposes on the observed

data a hyperbolic function with a very limited shape.

(ii) *Regressed asymmetrical hyperbolas:* A more flexible hyperbolic function is

$$u = a_2 + \frac{b_2}{v} \tag{4.11}$$

Since this equation, unlike (4.9), has two unknown parameters, it has to be submitted to regression analysis. For the subsequent estimate of the structural unemployment rate, a_2 is kept constant and b_2 permitted to vary with the residuals,[5] so that

$$u_{1_t} = \frac{1}{2}\left(a_2 + \sqrt{a_2^2 - 4a_2v_t + 4u_tv_t}\right) \tag{4.12}$$

Aside from the fact that this equation is complicated, it suffers from a statistical distortion. This distortion results from the fact that regression analysis minimizes the *vertical* deviations from the least-squares curve, whereas changes in structural imbalances result in shifts of the function *radially away from or toward the origin.* This radial shifting occurs because a change in the level of structural imbalance will be reflected in *proportionate* changes in the unemployment and vacancy rates at any given level of aggregate labour demand. This means that if, for example, the structural imbalance reflected in the function I is doubled, the unemployment rate and vacancy rate of each point of function I will be doubled to produce function II. In other words, function II is twice the distance from the origin that function I is.

Regression analysis, however, by minimizing the vertical deviations, produces a function which is flatter than the function that would be produced by minimizing the radial deviations. The reason is that the observations of a situation with a low level of structural imbalance will not only be below, but also to the left of the observations of a situation with a high level of structural imbalance. This can be seen in the simplified illustration in Figure 4.1(a). Let us assume that the economy has experienced two distinct levels of structural imbalance, one low (I) and the other high (II). For each level there are three observations, one at high demand (H), one at medium demand (M) and one at low demand (L). The curve which minimizes the radial deviations of the observations on I and II is III. The function which minimizes the vertical deviations, however, is IV,

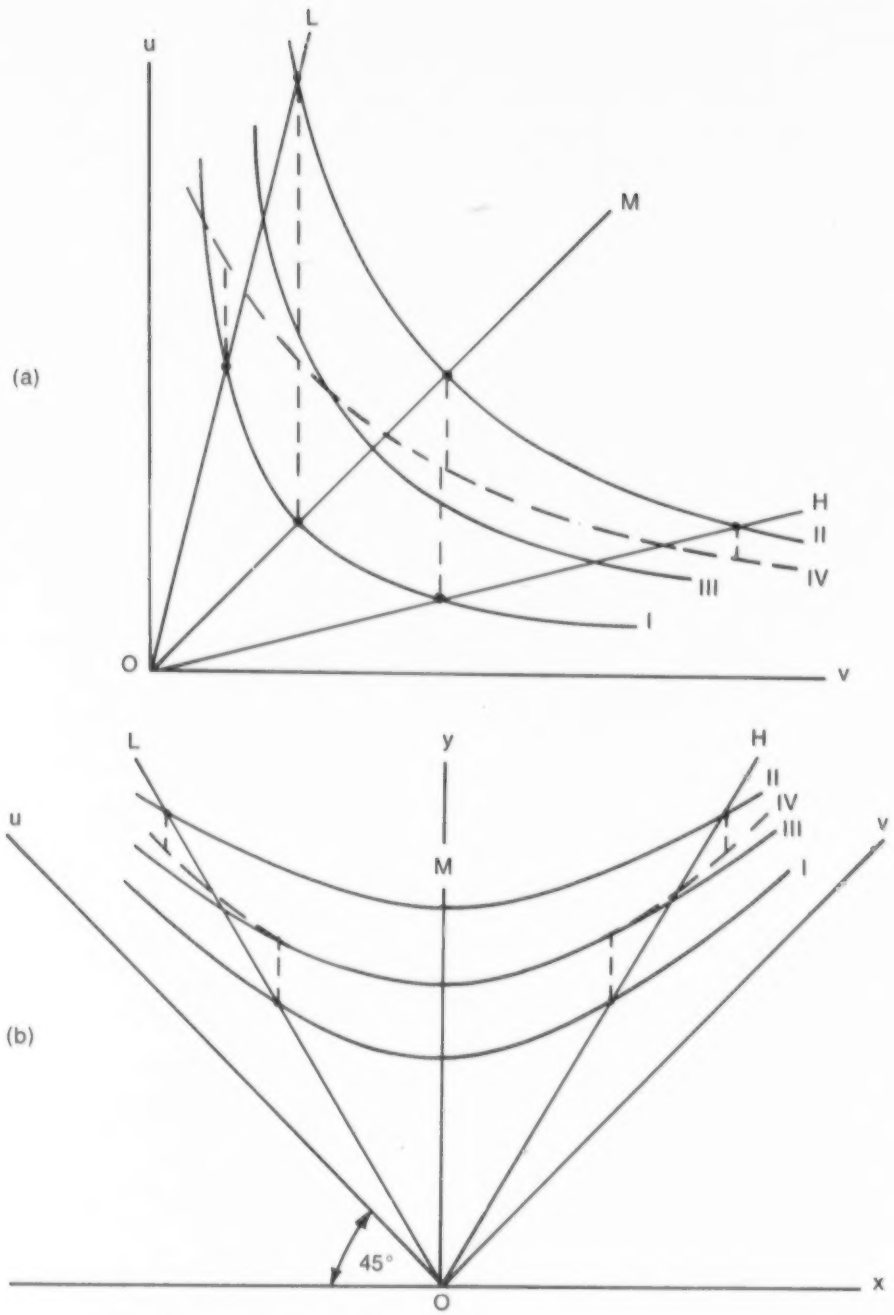

FIGURE 4.1
The effect of minimizing the residuals in the unemployment-vacancy relationship in the cases of (a) a hyperbolic function and (b) a parabola rotated by 45°

which is flatter than III, because the observations on I are to the left of the corresponding observations on II. In other words, the observations on the lower curve (I) are more influential on the regression line (IV) at its left end, and the observations on the upper curve (II) are more influential at the right end.

The estimate of the structural unemployment rate at any particular point of time is given by the point where the regression function, modified by the residual of the observation for the particular point of time, intersects the diagonal. Equation (4.12) then will provide estimates with an upward bias in low-demand periods and a downward bias in high-demand periods.[4]

Another asymmetrical hyperbola is

$$u = \frac{a_3}{v^{b_3}} \tag{4.13}$$

It can be submitted to regression analysis in logarithmic form. Keeping b_3 constant and letting a_3 vary with the residuals, the estimate of the structural unemployment rate is given by

$$u_{i_1} = \frac{(1 + b_3)}{\sqrt{u_i v_i^{b_3}}} \tag{4.14}$$

Unlike the hyperbola with the additive parameter, this exponential hyperbola is asymptotic with respect to both axes, and its asymmetry consists of a skew with respect to the diagonal. However, it too is afflicted by the bias resulting from the minimizing of the vertical deviations.

(iii) *Parabola rotated by 45°:* One alternative to minimizing the vertical deviations is to use a format which will permit minimizing the diagonal deviations. This is a reasonably good approximation to minimizing the deviations in line with the origin for the middle sector of the quadrant, but tends to excessively sharpen the curvature of the function near the axes. This format, therefore, tends to underestimate structural unemployment in periods of very high and very low demand.

In order to make this format amenable to regression analysis, the quadrant has to be rotated to the left by 45°, so that the u-axis lies between the y-axis and the negative x-axis of the new coordinate system and the v-axis lies between the y-axis and the positive x-axis.

(See Figure 4.1(b).) The redefinition of the coordinate system is given by the equations

$$x = \frac{v - u}{\sqrt{2}}$$

and

$$y = \frac{v + u}{\sqrt{2}}$$

Using a quadratic parabola to approximate a hyperbola rotated by 45°, we get the equation

$$y = a_4 + b_4 x^2$$

which, in terms of u and v, becomes

$$(v + u) = a_5 + b_5(v - u)^2 \tag{4.15}$$

where

$$a_5 = a_4\sqrt{2}$$

and

$$b_5 = \frac{b_4}{\sqrt{2}}$$

Keeping b_5 constant and letting a_5 vary with the residuals, the estimate of the structural unemployment rate is given by

$$u_{s_t} = \frac{v_t + u_t}{2} - \frac{b_5}{2}(v_t - u_t)^2 \tag{4.16}$$

This again is a symmetric function and, therefore, somewhat restrictive in that respect.

(iv) *Linear asymmetric function:* There is no plausible theoretical rationale for a linear relationship between the unemployment rate and the vacancy rate. Such a function would have to be kinked at the points where it meets the two axes. Within a limited range of demand level, however, it may provide a fairly good approximation of the relationship. It too is subject to the bias resulting from the minimization of the vertical deviations in regression analysis and is liable to overestimate structural unemployment in low-demand periods. In high-demand periods the bias can work in either direction. The equations are

$$u = a_6 + b_7 v \tag{4.17}$$

and

$$u_{s_t} = \frac{u_t - b_7 v_t}{1 - b_7} \tag{4.18}$$

(v) *The results of the regression analysis:* Four of the five

equations considered require regression analysis for quantification. The following results were obtained:

$$u = 0.8435 - \underset{(0.9411)}{10.6592}\,\frac{1}{v} \qquad R^2 = .72 \qquad (4.19)$$

$$\log_e u = 2.3927 - \underset{(0.0806)}{0.8388}\ \log_e v \qquad R^2 = .68 \qquad (4.20)$$

$$v + u = 7.1694 - \underset{(0.0072)}{0.0630}\ (v - u)^2 \qquad R^2 = .61 \qquad (4.21)$$

$$u = 9.2421 - \underset{(0.1489)}{1.5296}\ v \qquad R^2 = .68 \qquad (4.22)$$

The regression coefficients in all four equations are very significant at the .005 level. What seems curious at first glance is the relatively steep slope of (4.22). A look at the data, however, provides the reason. The great majority of observations are in the left sector of the quadrant. In only eight of the 52 observations does the vacancy rate exceed the unemployment rate. This is the probable reason why the linear function has such a good correlation coefficient: most of the observations are clustered around one flank of an essentially hyperbolic relationship but very few around the other. It is, therefore, probably a poor basis for estimating the rate of structural unemployment.

The fact that the data are very asymmetrically distributed with respect to the diagonal also affects the other functions permitting asymmetry. Thus (4.19) and (4.20) must also be viewed with suspicion.[5]

This leaves as the most reliable function (4.21) which at the same time has the lowest correlation coefficient. The value of the correlation coefficient, however, does not necessarily provide the best criterion for evaluating the alternative relationships. First, due to the different formulations of the dependent variable, the correlation coefficients are not comparable. Secondly, the correlation coefficient merely indicates which relationship attributes most of the variations in the unemployment rate to the vacancy rate, representing the level of demand, and least to other factors, which have been assumed to be structural. The ideal test, involving statistical variables for structural dislocations and adjustment, was not possible because of the problem of quantification. Therefore, while the correlation co-

efficient is a useful criterion, it is not the ultimate criterion.

The problem of the asymmetry of the data is sufficiently serious, as is demonstrated by the way in which it affected the regression coefficient in equation (4.22), that the symmetry criterion must take precedence over the correlation criterion, at least in the case where the differences between the correlation coefficients are so small. For this reason, equation (4.21) is considered to be the best estimate of the relationship between the unemployment rate and the vacancy rate.

c. Estimating the structural unemployment rate

(i) *The alternative estimated series:* The estimate of the structural unemployment rate based on equation (4.21) is given in Table II, together with the alternative estimates based on the other relationships, including equation (4.10), which did not require regression analysis. The range of alternative estimates should provide some indication of the degree of uncertainty attached to the estimated series. The uncertainty is naturally highest when there is very low or very high demand. Thus for late 1958 and late 1960 to early 1961 the range of estimates, including that of the linear function, is 0.5 and, excluding that of the linear function, 0.3.

It is remarkable how close the two series based on the two symmetrical functions (4.10) and (4.21), fit each other. This suggests that the equation

$$u_t = \sqrt{uv}$$

is a good estimator which is also simple.

(ii) *The trend:* The results suggest that the structural unemployment rate, that is, the unemployment rate adjusted for excess or deficient labour demand conditions, rose from about 3.0 per cent in 1953 to about 3.6 per cent in 1956 and, after a slight reduction in 1957-58, to about 3.9 per cent in 1962. This last level was maintained fairly steadily until the end of the analysis period, that is, 1965.

The increase in structural unemployment over the whole period is confirmed by formal statistical analysis. A regression analysis of the structural unemployment rate with respect to time yields

$$u_t = 3.175 + .0154\,t \qquad (4.23)$$

which, however, contains positive serial correlation. Upon removing this serial correlation[6] this equation becomes

$$u_t = 3.183 + .0160\,t \qquad (4.24)$$

where the regression coefficient is significant at the .001 level.

(iii) *Evaluation:* It is not easy to compare these results with those of Vanderkamp which were obtained from tests of the inflation-unemployment relationship.[7] The latter led to the conclusion that while there was a slight suggestion that the inflation-unemployment function has shifted outward slightly, there was no evidence that this shift was significant.

There are three possible explanations for this difference in results. First of all, it is possible that the other variable that Vanderkamp introduced into his tests, the rate of change of import prices, has increased over time. More plausible is the possibility that the relationship between price inflation and the vacancy rate has changed over time. Finally, the vacancy statement ratio may have increased over time and led to a spurious rise in the estimated structural unemployment rate.

It is possible that the latter explanation might apply to the increase in the estimated structural unemployment rate from 1957 to 1962. Table I showed that the ratio of total hirings to N.E.S. placements declined during that period. This suggests that the proportion of total vacancies reported to the N.E.S. increased, and that for 1957-58 the vacancy rate was underestimated and for 1961-62 overestimated. Similarly the structural unemployment rate would then be underestimated in 1957-58 and overestimated in 1961-62. If the ratio of hirings to N.E.S. placements is really indicative of fluctuations in the vacancy statement ratio, however, the rise of the estimated structural unemployment rate between 1953 and 1956 would be an underestimate and there should have been a rise after 1962. In general, the structural unemployment rates for 1953 and 1961-65 would be overestimates, while those for 1954-60 would be underestimates. It should be noted, however, that the hirings-N.E.S. placement ratio is more or less the same for 1953 and 1963-65, while there is a considerable difference in the estimated structural unemployment rate for these two periods.

Table II

Estimates of the Structural Unemployment Rate[1]

Period		Unemployment Rate	Estimated Vacancy Rate[2]	Structural Unemployment Rate Estimated on the Basis of: Asymmetric Relationships			Symmetric Relationships	
				Linear[3]	Non-Exponential Hyperbolic[4]	Logarithmic[5]	Simple Hyperbolic[6]	Rotated Parabola[7]
53	I	2.8	3.4	3.2	3.0	3.1	3.1	3.1
	II	2.6	3.2	3.0	2.8	2.9	2.9	2.9
	III	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	IV	3.9	2.6	3.1	3.3	3.2	3.2	3.2
54	I	4.0	2.3	3.0	3.1	3.1	3.0	3.1
	II	4.7	2.1	3.1	3.3	3.3	3.1	3.2
	III	5.2	2.0	3.3	3.4	3.4	3.2	3.3
	IV	5.0	2.2	3.3	3.5	3.4	3.3	3.4
55	I	4.8	2.2	3.2	3.4	3.4	3.2	3.3
	II	4.4	2.4	3.2	3.4	3.3	3.2	3.3
	III	4.1	2.9	3.4	3.5	3.5	3.4	3.5
	IV	3.8	3.5	3.6	3.7	3.7	3.6	3.6
56	I	3.7	3.8	3.8	3.7	3.7	3.7	3.7
	II	3.4	4.0	3.8	3.6	3.7	3.7	3.7
	III	3.0	4.2	3.7	3.5	3.5	3.5	3.6
	IV	3.1	4.1	3.7	3.5	3.5	3.6	3.6
57	I	3.9	3.4	3.6	3.7	3.7	3.6	3.6
	II	4.1	2.9	3.4	3.5	3.5	3.4	3.5
	III	5.0	2.2	3.3	3.5	3.4	3.3	3.4
	IV	6.0	1.8	3.5	3.5	3.5	3.3	3.3

Table II — (Continued)

Period		Unemployment Rate	Estimated Vacancy Rate[2]	Structural Unemployment Rate Estimated on the Basis of: Asymmetric Relationships: Linear[3]	Asymmetric Relationships: Non-Exponential Hyperbolic[4]	Asymmetric Relationships: Logarithmic[5]	Symmetric Relationships: Simple Hyperbolic[6]	Symmetric Relationships: Rotated Parabola[7]
58	I	6.6	1.7	3.6	3.6	3.6	3.3	3.4
	II	7.2	1.8	3.9	3.8	3.8	3.6	3.6
	III	7.4	1.6	3.9	3.7	3.7	3.4	3.4
	IV	7.3	1.6	3.9	3.7	3.7	3.4	3.4
59	I	6.2	2.0	3.7	3.7	3.7	3.5	3.5
	II	5.9	2.1	3.6	3.7	3.7	3.5	3.5
	III	5.6	2.1	3.5	3.6	3.6	3.4	3.5
	IV	5.8	2.1	3.6	3.7	3.6	3.5	3.5
60	I	6.3	1.9	3.6	3.7	3.6	3.4	3.5
	II	6.9	2.0	3.9	3.9	3.9	3.7	3.7
	III	7.4	1.8	4.0	3.9	3.9	3.6	3.6
	IV	7.6	1.8	4.1	3.7	3.9	3.7	3.6
61	I	7.6	1.8	4.1	3.9	3.9	3.7	3.6
	II	7.5	1.8	4.1	3.9	3.9	3.7	3.6
	III	7.0	2.1	4.0	4.0	4.0	3.8	3.8
	IV	6.2	2.1	3.7	3.8	3.8	3.6	3.6
62	I	6.0	2.4	3.8	4.0	4.0	3.8	3.8
	II	5.7	2.6	3.8	4.0	4.0	3.8	3.8
	III	5.8	2.7	3.9	4.1	4.1	4.0	3.9
	IV	5.9	2.7	4.0	4.1	4.1	4.0	4.0

Table II — (Concluded)

Period		Unemployment Rate	Estimated Vacancy Rate[2]	Structural Unemployment Rate Estimated on the Basis of: Asymmetric Relationships: Linear[3]	Asymmetric Relationships: Non-Exponential Hyperbolic[4]	Asymmetric Relationships: Logarithmic[5]	Symmetric Relationships: Simple Hyperbolic[6]	Symmetric Relationships: Rotated Parabola[7]
63	I	5.9	2.6	3.9	4.1	4.1	3.9	3.9
	II	5.6	2.7	3.8	4.0	4.0	3.9	3.9
	III	5.4	2.9	3.9	4.1	4.1	4.0	4.0
	IV	5.2	3.1	3.9	4.1	4.1	4.0	4.0
64	I	4.9	3.3	3.9	4.1	4.1	4.0	4.0
	II	4.8	3.1	3.8	4.0	3.9	3.9	3.9
	III	4.6	3.2	3.8	3.9	3.9	3.8	3.8
	IV	4.5	3.4	3.8	4.0	4.0	3.9	3.9
65	I	4.1	3.5	3.7	3.8	3.8	3.8	3.8
	II	4.2	3.7	3.9	4.0	4.0	3.9	3.9
	III	3.8	3.9	3.9	3.8	3.8	3.8	3.8
	IV	3.5	4.1	3.9	3.7	3.8	3.8	3.8

[1] All data are seasonally adjusted.

[2] For estimation procedure see section 1(a) in Chapter IV.

[3] Based on equations (4.22) and (4.18).

[4] Based on equations (4.19 and (4.12).

[5] Based on equations (4.20) and (4.14).

[6] Based on equation (4.10).

[7] Based on equations (4.21) and (4.16).

Sources: (1) For employment, unemployment and labour force, seasonally adjusted: Canada, Dominion Bureau of Statistics, **Seasonally Adjusted Labour Force Statistics,** January 1953 - December 1966, Cat. No. 71-201, Queen's Printer, Ottawa.

(2) For reported vacancies: Canada, Department of Labour, **Labour Gazette,** Queen's Printer, Ottawa.

FOOTNOTES TO CHAPTER IV

[1] This decision subsequently created certain difficulties. See section 2 b(v) and footnote 5 below.

[2] For the attempt, see the appendix to this chapter.

[3] For the reasons for this choice, see the footnote at the end of the following discussion.

[4] The reason for letting b_2 rather than a_2 vary with the residual now becomes clear. If a_2 varies with the residual, the bias mentioned above is compounded by the fact that the *variability* of structural unemployment in low-demand periods will be over-estimated, while in high-demand periods it will be underestimated. This is so because varying a_2 involves *vertical* shifts, and a radial shift of the function, as occurs according to the theory propounded, involves a greater vertical shift on the left end and smaller vertical shift on the right end. Varying b_2 with the residual, however, by changing the curvature of the function, has an effect which comes closer to radial shifting.

[5] This problem suggests that it was a mistake to limit the period of analysis to the years since 1953. Unfortunately it had not become apparent until after the statistical work had been completed. Time limitations prevented a revision of the analysis.

[6] This operation was performed for me by Philip B. Fay of the Department of Manpower and Immigration. It is based on the procedure proposed by J. Johnston (*Econometric Methods*, McGraw-Hill Book Co., Inc., 1963, pp. 195-199). If, in the equation

$$u_s = b_0 + b_1 t + r$$

where t = time, b_0 and b_1 are regression coefficients, and r is the residual, the latter is such that

$$r_t = kr_{(t-1)} + e_t$$

$$\text{then } r = \frac{\sum_{t=2}^{n} r_t r_{(t-1)}}{\sum_{t=2}^{n} r^2_{(t-1)}}$$

The original variable, u_s, is then transformed into

$$u'_t = u_{s_t} - ru_{s_{(t-1)}}$$

and submitted to regression analysis, which yielded

$$u' = 1.1567 + .00583\ t$$

with a Durbin-Watson statistic of 2.12. Reconversion to u_s resulted in equation (4.24).

[7] J. Vanderkamp, "An Application of Lipsey's Concept of Structural Unemployment," **Review of Economic Studies,** July 1966, pp. 221-225.

APPENDIX TO CHAPTER IV

AN ATTEMPT TO QUANTIFY THE RATES OF STRUCTURAL DISPLACEMENT AND ADJUSTMENT

In the discussion of methodological considerations for estimating the structural unemployment rate in the preceding chapter, I said that an attempt was made at one point to find proxies for the rates of structural displacement and adjustment. This appendix serves to describe that attempt.

In Chapter II, the major causes of structural dislocation were identified as shifts in consumer demand, technological changes, shortages in primary and intermediate goods and geographic shifts in production. Consumer demand and the availability of primary and intermediate goods will directly affect the industry structure of output. The effect of technological change on employment is best measured in terms of labour productivity. Thus, two possible determinants of the rate of structural dislocation are the rate of productivity growth and the rate of change in the industry structure of output. The first, $\dot{P}$, was measured in terms of the rate of change in GNE per employed person. The second variable, I, was measured in terms of the sum of absolute weighted changes in the indices of industrial production. Algebraically, this construction can be represented by the formula

$$I_t = \sum_i \left| y_{it} - y_{i(t-1)} \right| w_i \qquad (4.A.1)$$

The rate of structural adjustment, b'_s, was seen as related to the number of different possible combinations of vacancies and unemployed which could lead to hirings. If this relationship is linear, then

$$b'_s = a'_1 uv \qquad (4.A.2)$$

where a'_1 is a constant. An additional point considered was that structural adjustment occurs not only by matching unemployment and vacancies directly, but also by the movement of employed persons into available higher-paying vacancies and of the unemployed into the thereby vacated jobs. The effect that this process will have on structural adjustment can be assumed to depend on the number of possible combinations between the unemployed and the jobs vacated by voluntary turnover. When combined with equation (4.A.2) this gives us

$$b'_s = a'_1 uv + a'_2 uz \qquad (4.A.3)$$

The voluntary turnover rate, z, was assumed to be determined by the number of possible combinations of the employed and the vacancies, i.e.,

$$z = a_3' ev \tag{4.A.4}$$

where e is the percent of the labour force employed. Then

$$\begin{aligned} b_j' &= a_1' uv + a_2' u a_3' ev \\ &= a_1' uv + a_2' a_3' u (100 - u)v \\ &= a_1' uv + 100 a_2' a_3' uv - a_2' a_3' u^2 v \end{aligned}$$

so that $$b_j' = a_1 uv - a_2 u^2 v \tag{4.A.5}$$

where $$a_1 = a_1' + 100 a_2' a_3' \text{ and } a_2 = a_2' a_3'.$$

The resulting equation was

$$\Delta u = f_1(\dot{P}, I) - a_1 uv - a_2 u^2 v + \Delta f_2 (d) \tag{4.A.6}$$

where d is the relative labour demand, which is defined by

$$d = e + v \tag{4.A.7}$$

or $$d = 100 - u + v$$

It will be noted that this variable replaced the vacancy rate as the indicator of the business cycle. The reason is that in the earlier phase of research, the relative labour demand variable was used and it was only after the work described in this appendix that the simpler formulation involving the vacancy rate was adopted.

The relationship

$$u = f_2 (d) \tag{4.A.9}$$

implicit in equation (4.A.6) was assumed to be quadratic, that is,

$$u = a_0'' + a_1'' d + a_2'' d^2$$

In the range $0 < \frac{du}{dd} < 1$, this formulation is very similar to a hyperbolic relationship between u and v.

Equation (4.A.6) now becomes

$$\begin{aligned} \Delta u_t = b_0 &+ b_1 \Delta d_t + b_2 \Delta (d_t^2) + b_3 \dot{P}_t + b_4 I_t \\ &+ b_5 u_{(t-1)} v_{(t-1)} + b_6 u_{(t-1)}^2 v_{(t-1)} \end{aligned} \tag{4.A.11}$$

The regression analysis of this equation produced the following statistical relationship:

$$\begin{aligned} \Delta u_t = 0.3698 &- \underset{(1.0746)}{4.8171} \Delta d_t + \underset{(0.0054)}{0.0217} \Delta (d_t^2) + \underset{(0.0168)}{0.0082} \dot{P}_t \\ &- \underset{(0.0163)}{0.167} I_t - \underset{(0.0083)}{0.0179} u_{(t-1)} v_{(t-1)} + \underset{(0.0008)}{0.0003} u_{(t-1)}^2 v_{(t-1)} \end{aligned}$$

$$R^2 = .92 \tag{4.A.12}$$

This is a marginally better fit than the purely cyclical relationship

$$\Delta u_t = \underset{}{0.0178} - \underset{(1.0593)}{4.3739}\,\Delta d_t + \underset{(0.0053)}{0.0194}\,\Delta (d_t^2)$$

$$R^2 = .91 \qquad (4.A.13)$$

Neither of the two proxies for the rate of structural dislocation in equation (4.A.12), the rate of productivity growth ($\dot{P}$) and the index of change in the industrial output structure (I), significantly contributed to the statistical explanation of Δu. The regression coefficient for the former was not even significant at the .25 level of significance. The regression coefficient of the latter had a perverse sign, in that it did not make sense on the basis of the theoretical postulates stated at the beginning of this appendix. Changes in the industrial structure of output should aggravate structural imbalances and increase unemployment, and the regression coefficient should therefore be positive. Since the coefficient is not significant at the .10 significance level, the negative sign is attributed to randomness.

Of the proxy variables for the rate of structural adjustment, one of them, u^2v, is also not significant at the .25 level. This means that either the hypothesis that the voluntary turnover rate is linearly related to the number of possible combinations of employed and vacancies (4.A.4) or the hypothesis that the hiring rate is influenced by the number of possible combinations of unemployed and jobs vacated by voluntary turnover (4.A.3), or both, are wrong.

The remaining variables yield the following equation:

$$\Delta u_t = \underset{}{0.2873} - \underset{(1.0037)}{4.7463}\,\Delta d_t + \underset{(0.0054)}{0.0214}\,\Delta (d_t^2) - \underset{(0.0065)}{0.0142}\,u_{(t-1)}\,v_{(t-1)} \qquad R^2 = .92 \quad (4.A.14)$$

The regression coefficient for the variable $u_{(t-1)}\,v_{(t-1)}$ is significant at the .025 level. This means there is statistical support for the hypothesis that the rate of structural adjustment depends, in part, on the degree of structural imbalance. In other words, the greater the structural imbalance, the greater become the forces that reduce it.

Aside from this proxy for the rate of structural adjustment, the above attempt to discover variables that explain the changes in the level of structural imbalance must be deemed unsuccessful. Certainly the rate of structural dislocation remains statistically unexplained.

CHAPTER V

CONCLUSION

The purpose of this thesis has been to develop a theoretical framework which could be used to measure structural unemployment. In this final chapter the theory (both the survey of the literature and the model developed in Chapter III) will be briefly summarized, the problems and results of the empirical analysis recapitulated, the policy implications briefly explored, and lines of further research suggested.

1. Summary of the Theory

The survey chapter on the theory of structural unemployment began with describing the causal approach to the analysis of structural unemployment. It was shown how structural unemployment is explained in terms of changes in the structure of final demand and technological change, and how the labour-displacement effect of the latter depended on the price and income elasticities of demand of the affected industries.

These determinants explain only the rate of structural displacement. Therefore the structural maladjustment approach, which stresses the role of structural adjustment and the factors inhibiting it, was considered. The various kinds of substitution promoting the reabsorption of displaced labour, as well as rigidities and lags working against it, were outlined. Dow and Dicks-Mireaux's vacancy model was then investigated and found to be of considerable value, but at the same time to be lacking in theoretical explanation. A scrutiny of the methods for determining the degree of structural

imbalance by analyzing the structure of unemployment led to the conclusion that there were unsolved problems in the distinction between the structure of demand-deficiency unemployment and that of structural unemployment. Long-duration unemployment, which was used as an index of structural unemployment in another kind of model, was found not to be directly identifiable with structural unemployment.

The policy approach is concerned with the relationship of unemployment and inflation. It consists of Lipsey's trade-off model, according to which the degree of structural maladjustment is indicated by the distance of the inflation-unemployment function from the origin. There are problems involved in using it to measure structural unemployment, however, because of the subjective and potentially varying policy-makers' preferences and the impurities involved in the inflation-unemployment relationship.

In spite of the data problems for a model using the vacancy variable, it was considered worthwhile to develop a model which does not have to depend on proxies for labour demand and structural imbalance, whose construction has a theoretical rationale and which satisfactorily separates the effects of aggregate demand and of structural imbalance on unemployment. It consists of determining the cyclical relationship between the unemployment and vacancy rates, and attributing changes which cannot be explained by this relationship to changes in the level of structural imbalance.

2. The Empirical Analysis

Before this model could be applied to Canadian data, the vacancy rate had to be derived from National Employment Service vacancy data. Based on a comparison of the economy's volume of hirings and the volume of N.E.S. placements, the ratio of actual vacancies to N.E.S. vacancies was estimated to be 4.7. This factor was used to estimate the economy's vacancy rate.

Several forms of the relationship between the unemployment and estimated vacancy rates were tested. On the basis of the biases resulting from the asymmetrical distribution of the empirical observations in functions permitting asymmetry, it was decided that the best form was a parabola rotated by 45°. The results of the other forms were also presented and are not very different except in the period of very deficient demand.

In Figure 5.1 the structural and demand-deficiency components of the unemployment rate according to the rotated parabola estimate are plotted. While there has been some upward trend in the structural unemployment rate, with the biggest increases concentrated in 1955-56 and 1961-62, most of the changes in the total unemployment rate are attributable to variations in demand-deficiency unemployment. These results suffer from uncertainty involved in the estimated vacancy rate that was used, but the slight upward trend in the structural unemployment rate was reinforced by a look at the trend in the ratio of hirings to N.E.S. placements.

3. Policy Implications

The level of the structural unemployment rate has been estimated at about 3½ per cent, rising from 3 per cent in the early 1950's to nearly 4 per cent in the 1960's. It should be noted that this is the unemployment rate that prevails when there is neither excess nor deficient aggregate labour demand, that is, when unemployment and vacancies are equal. It is not necessarily the unemployment that prevails when there is the *optimum* level of aggregate demand, which may be either excess or deficient. Since there is relatively great concern with inflation on the part of Canadian governments, the policy-makers' preferred level has tended to be deficient rather than excess demand. Therefore, the level of unemployment which is to be dealt with by selective manpower policies is relatively high.

The increases in unemployment in 1953-54, 1957-58 and 1959-60, however, were almost entirely due to declines in aggregate demand, and the responsibility for dealing with them lay in macroeconomic policy. Unfortunately its application in 1957-62 was contradictory. According to W. L. Winder:

> "with a flexible exchange rate, fiscal expansion tends to raise employment but also to increase foreign competition, because interest rates rise and attract foreign capital, resulting in an increase in the exchange rate (which makes imports cheaper and exports costlier). Both the direct and indirect effects of monetary expansion would tend to increase employment, given a flexible exchange rate. The main reliance in Canada up to 1962 should, therefore, have been placed on monetary policy whereas, on the contrary,

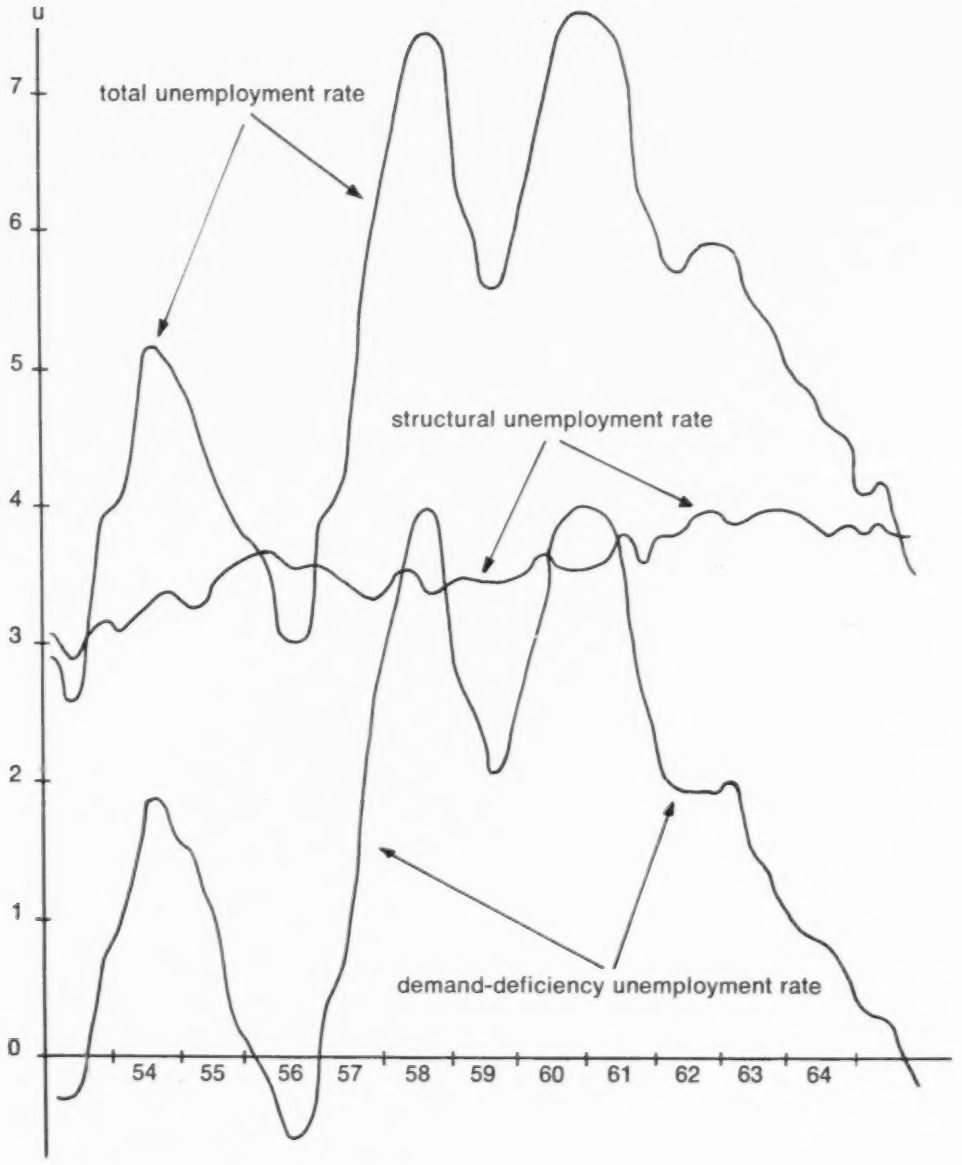

FIGURE 5.1
Quarterly series of total, structural and demand-deficiency unemployment rates, based on the rotated parabola estimate

expansionary fiscal policy was employed in a vain attempt to offset contradictionary [sic] monetary policy."[1]

As a matter of fact, even fiscal policy at the time was expansionary only in a very hesitant way.

4. Further Research

Two lines of further work in the area of structural unemployment would be particularly useful. The first one is to put the problem into a dynamic framework and to analyze and quantify the determinants of structural dislocation, on the one hand, and of structural adjustment, on the other. The second line is to determine which kinds of selective manpower policy are most appropriate to assist the adjustment process. Both lines require a much more disaggregative approach than could be adopted in the empirical part of this thesis.

FOOTNOTE TO CHAPTER V

[1] W. L. Winder, **Canadian Labour Market,** p. 172.

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